















Engine



# 1 Glossary

<p>①</p> 	<p>②</p> 
<p>③</p> 	<p>④</p> 
<p>⑤</p> 	<p>⑥</p> 
<p>⑦</p> 	<p>⑧</p> 
<p>⑨</p> 	<p>⑩</p> 
<p>⑪</p> 	<p>⑫</p> 

Illustrated symbols ① to ⑥ are used to identify the specifications appearing in the text.

- ① Special tool
- ② Filling fluid
- ③ Lubricant
- ④ Tightening
- ⑤ Specified value, Service limit
- ⑥ Resistance ( $\Omega$ ), Voltage (V), Electric current (A)

Illustrated symbols ⑦ to ⑩ in the exploded diagrams indicate grade of lubricant and location of lubrication point.

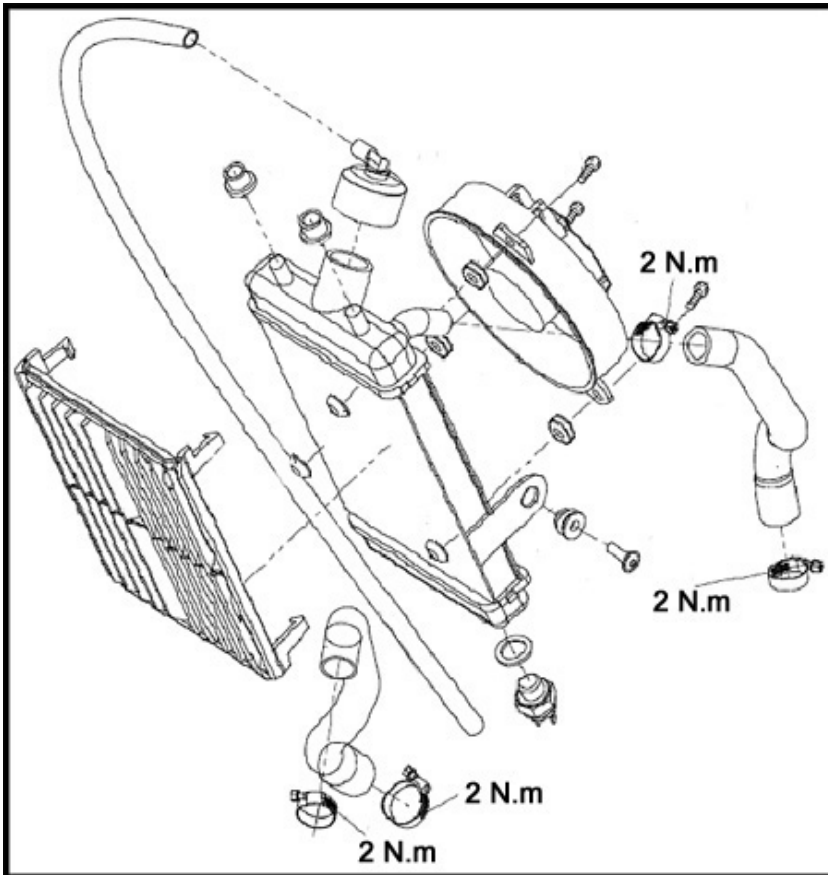
- ⑦ Apply engine oil
- ⑧ Apply molybdenum disulfide oil
- ⑨ Apply lightweight lithium-soap base grease
- ⑩ Apply molybdenum disulfide grease

Illustrated symbols ⑪ to ⑫ in the exploded diagrams indicate where to apply a locking agent and where to install new parts.

- ⑪ Apply locking agent (LOCTITE®)
- ⑫ Use new one



## 2 Radiator



### RADIATOR REMOVAL :

- Remove the fuel tank cover, the air cleaner case (see "side covers removal").
- Remove the fuel tank and the side covers (see "fuel tank removal").
- Unscrew the water pump hose collar (at the bottom right side).
- Unscrew the radiator cap.
- Take out the water pump hose and keep the liquid cooler

**WARNING :** this operation must be done the engine cold. Don't throw out the liquid in the nature).

- Unscrew the radiator fixing bolt (at the left side).
- Unscrew the engine hose collar.
- Take out the engine hose.
- Unplug the temperature sensor.
- Remove carefully the radiator from the frame.
- Unscrew the radiator hose collars.
- Take out the radiator hoses.

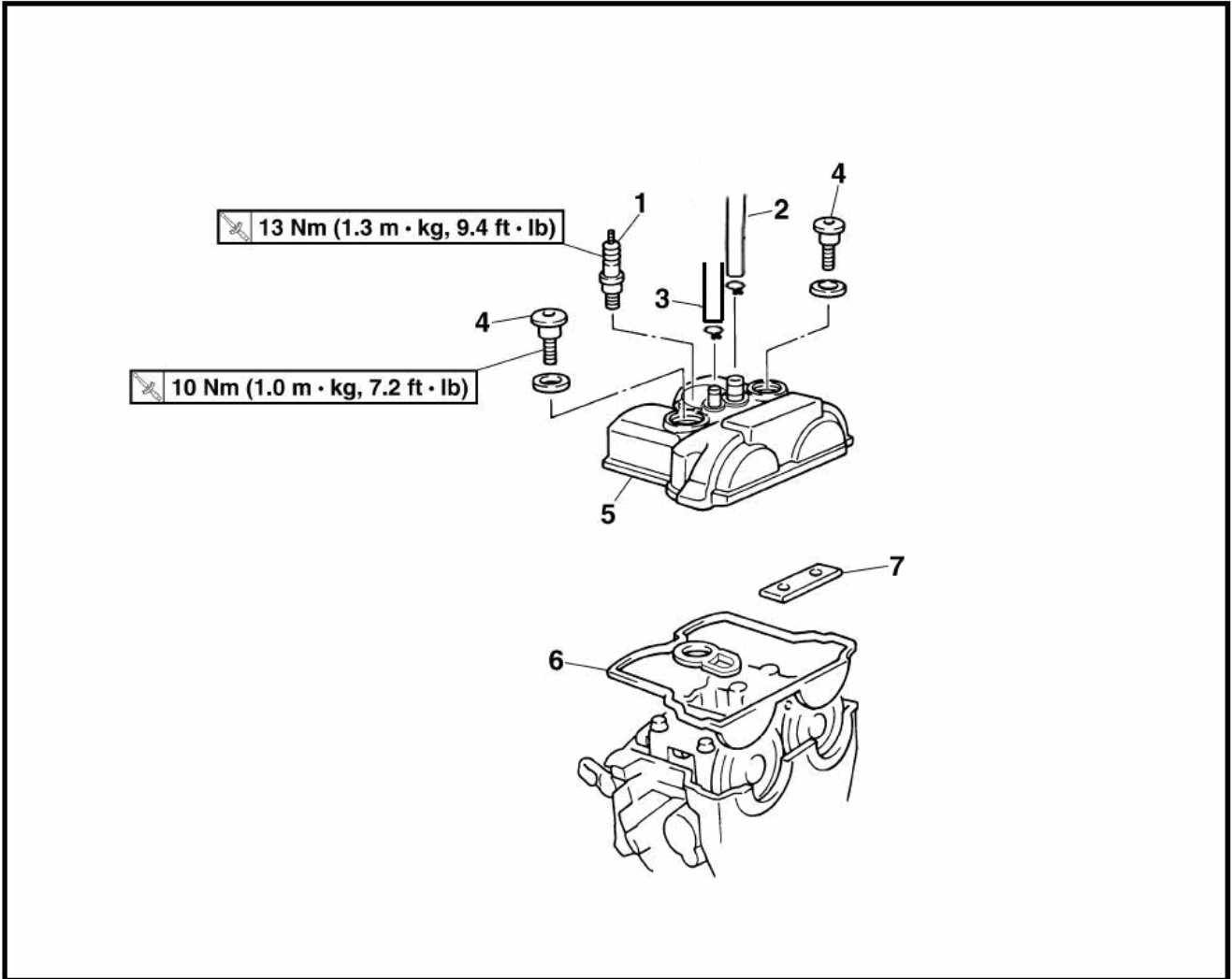
### RADIATOR INSTALLATION :

- Install the hoses on the radiator.
- Screw the radiator hose collars.
- Plug the temperature sensor.
- Install the radiator in the frame.
- Screw the radiator fixing bolts in the welnut.
- Install the hose on the engine and screw the collar.
- Install the hose on the water pump and screw the collar.
- Fill the radiator with liquid cooler.
- Screw the cap.
- Install the fuel tank and the side covers (see "fuel tank installation").
- Install the fuel tank, the air cleaner case cover (see "side covers installation").



### 3 CAMSHAFTS

#### 3.1 Cylinder head cover

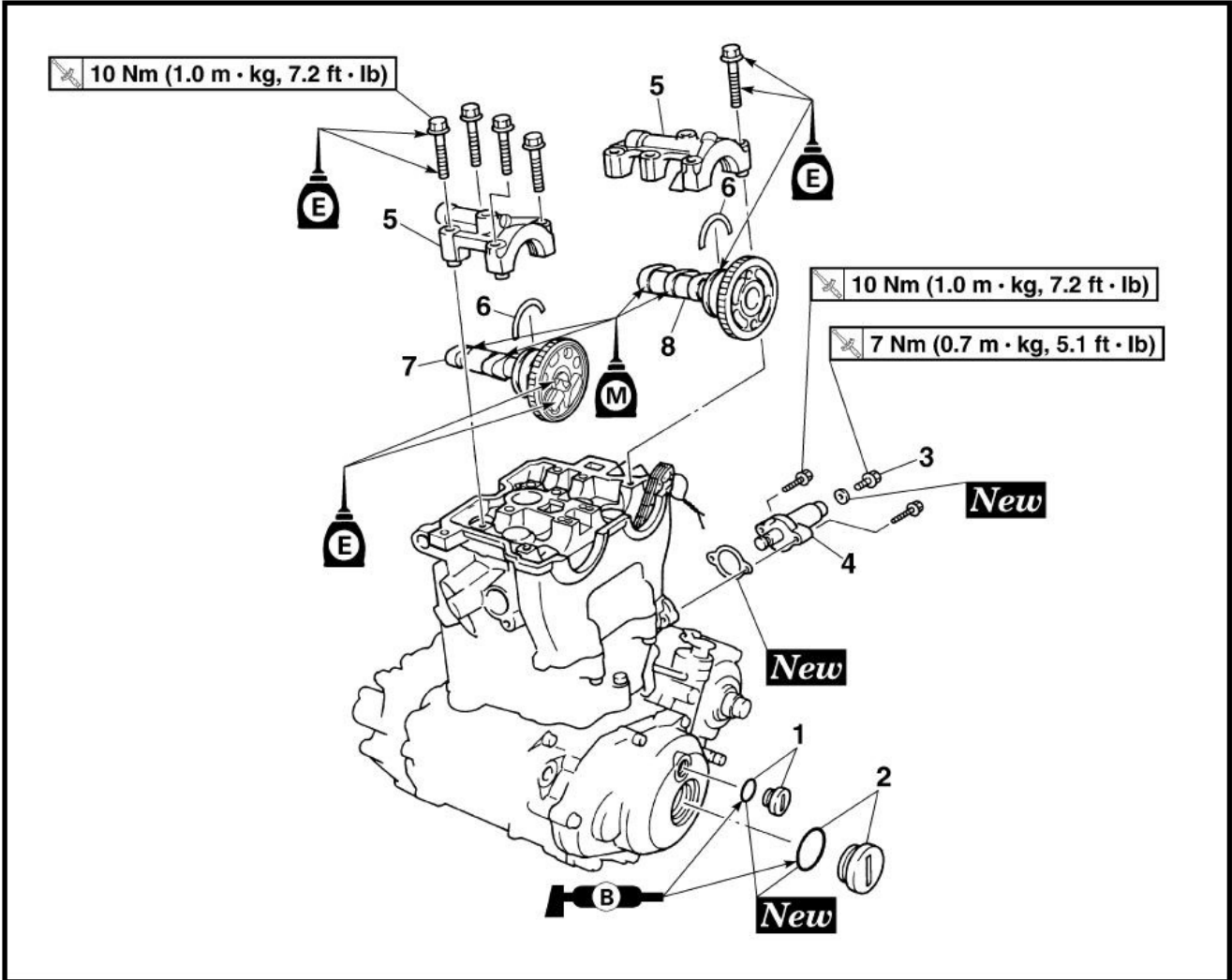


Extent of removal: ① Cylinder head cover removal

Extent of removal	Order	Part name	Q'ty	Remarks
Preparation for removal		<b>CYLINDER HEAD COVER REMOVAL</b>		
		Seat and fuel tank		Refer to "SEAT, FUEL TANK AND SIDE COVERS" section.
		Carburetor		Refer to "CARBURETOR" section.
①	1	Spark plug	1	
	2	Cylinder head breather hose	1	
	3	Oil tank breather hose	1	
	4	Bolt (cylinder head cover)	2	
	5	Cylinder head cover	1	
	6	Cylinder head cover gasket	1	
	7	Timing chain guide (top side)	1	



3.2 Camshafts



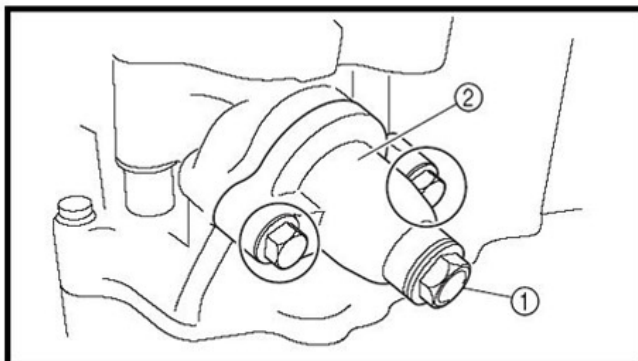
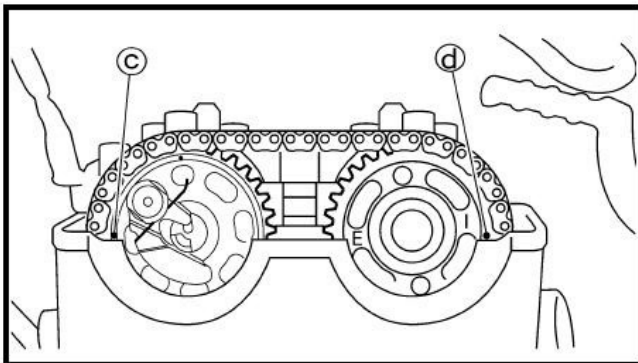
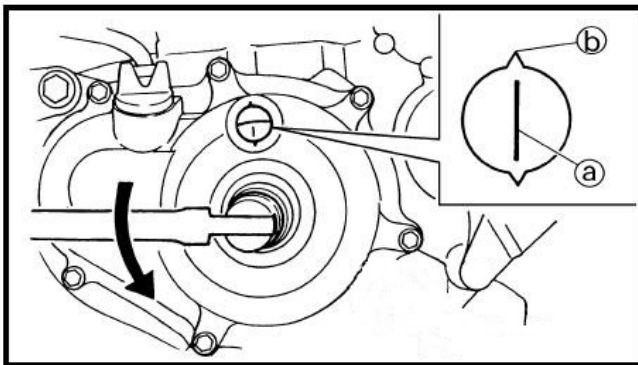
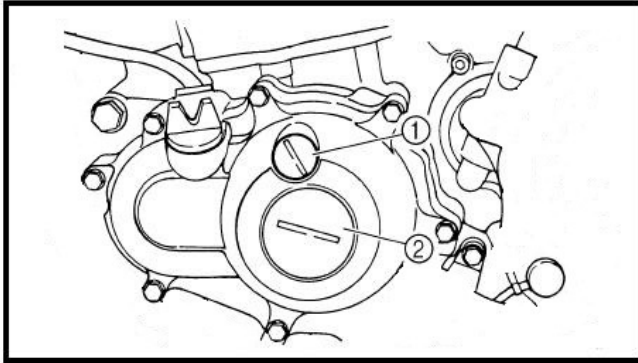
Extent of removal: ① Camshaft removal

Extent of removal	Order	Part name	Q'ty	Remarks
	<b>CAMSHAFTS REMOVAL</b>			
	1	Timing mark accessing screw	1	Refer to "REMOVAL POINTS".
	2	Crankshaft end accessing screw	1	
	3	Timing chain tensioner cap bolt	1	
	4	Timing chain tensioner	1	
	5	Camshaft cap	2	
	6	Clip	2	
	7	Exhaust camshaft	1	
8	Intake camshaft	1		



### 3.3 Removal points

#### 3.3.1 Camshafts



1. Remove:
  - Timing mark accessing screw ①
  - Crankshaft end accessing screw ②
2. Align:
  - T.D.C. mark
  - With align mark.

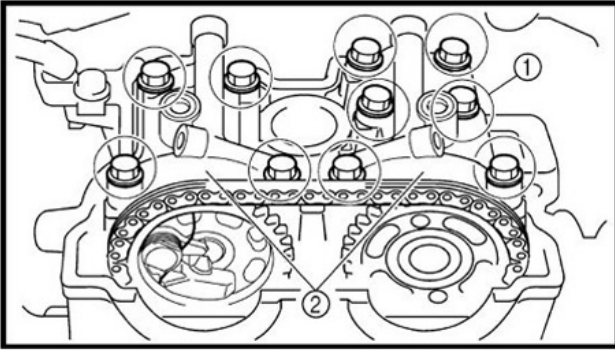
#### Checking steps:

- Turn the crankshaft counterclockwise with a wrench.
- Align the T.D.C. mark ③ on the rotor with the align mark ④ on the crankcase cover when piston is at T.D.C. on compression stroke.

#### NOTE:

In order to be sure that the piston is at Top Dead Center, the punch mark ③ on the exhaust camshaft and the punch mark ④ on the intake camshaft must align with the cylinder head surface, as shown in the illustration.

3. Remove:
  - Timing chain tensioner cap bolt ①
  - Timing chain tensioner ②
  - Gasket

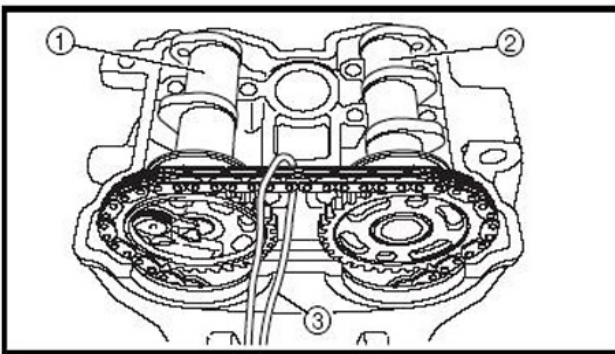


4. Remove:
- Bolt (camshaft cap) ①
  - Camshaft cap ②
  - Clip

**NOTE:** \_\_\_\_\_  
Remove the bolts (camshaft cap) in a criss-cross pattern, working from the outside in.

**CAUTION:** \_\_\_\_\_

The bolts (camshaft cap) must be removed evenly to prevent damage to the cylinder head, camshafts or camshaft caps.



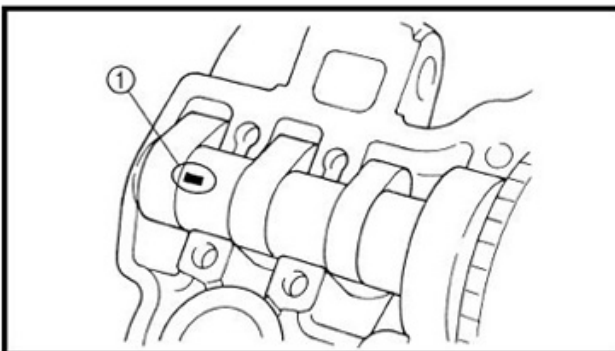
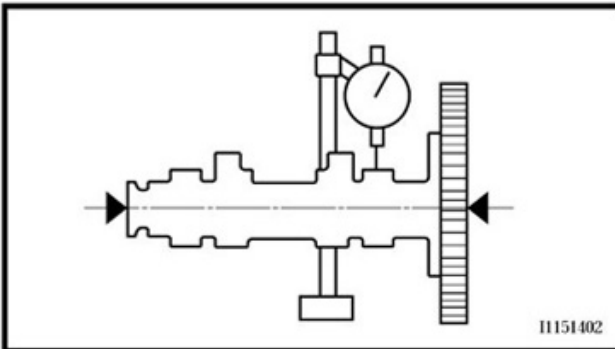
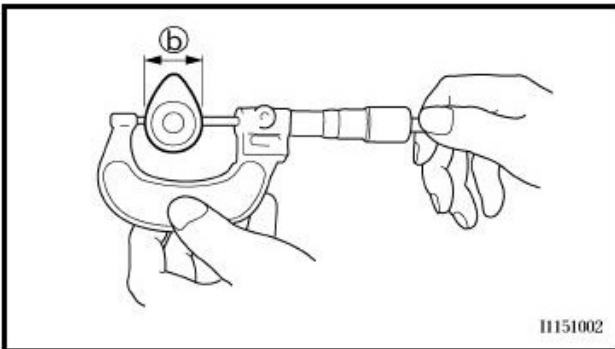
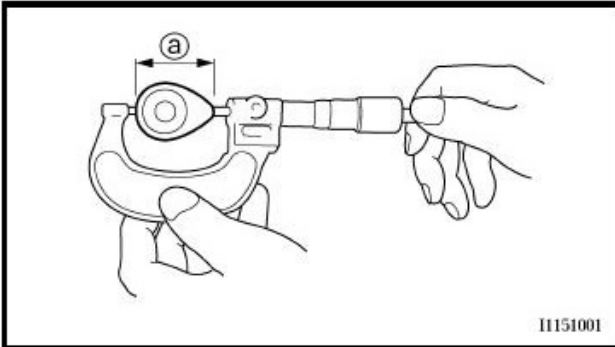
5. Remove:
- Exhaust camshaft ①
  - Intake camshaft ②

**NOTE:** \_\_\_\_\_  
Attach a wire ③ to the timing chain to prevent it from falling into the crankcase.



### 3.4 Inspection

#### 3.4.1 Camshafts



1. Inspect:
  - Cam lobe  
Pitting/scratches/blue discoloration → Replace.
2. Measure:
  - Cam lobe length (a) and (b)  
Out of specification → Replace.

Cam lobes length:	
<b>Intake:</b>	
(a)	30.296 ~ 30.346 mm (1.1923 ~ 1.1947 in) <Limit>: 30.196 mm (1.1888 in)
(b)	22.45 ~ 22.55 mm (0.8839 ~ 0.8878 in) <Limit>: 22.35 mm (0.8799 in)
<b>Exhaust:</b>	
(a)	30.399 ~ 30.499 mm (1.1968 ~ 1.2007 in) <Limit>: 30.299 mm (1.1929 in)
(b)	22.45 ~ 22.55 mm (0.8839 ~ 0.8878 in) <Limit>: 22.35 mm (0.8799 in)

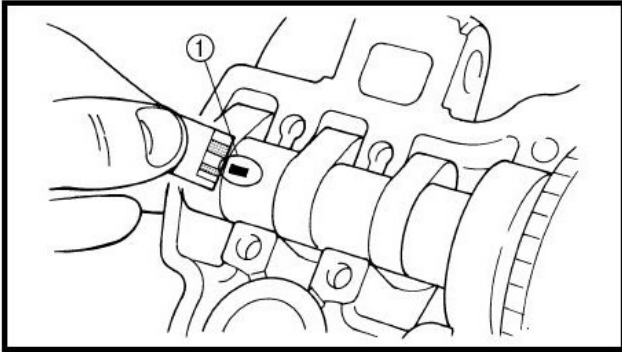
3. Measure:
  - Runout (camshaft)  
Out of specification → Replace.

Runout (camshaft):	
	Less than 0.03 mm (0.0012 in)

4. Measure:
  - Camshaft-to-cap clearance  
Out of specification → Measure camshaft outside diameter.

Camshaft-to-cap clearance:	
	0.028 ~ 0.062 mm (0.0011 ~ 0.0024 in) <Limit>: 0.08 mm (0.003 in)



**Measurement steps:**

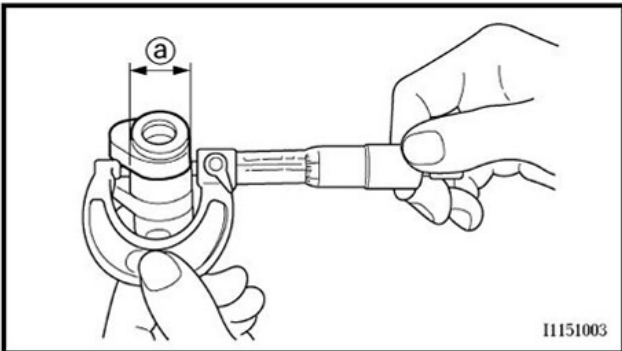
- Install the camshaft onto the cylinder head.
- Position a strip of Plastigauge® ① onto the camshaft.
- Install the clip, dowel pins and camshaft caps.



**Bolt (camshaft cap):**  
10 Nm (1.0 m • kg, 7.2 ft • lb)

**NOTE:**

- Tighten the bolts (camshaft cap) in a criss-cross pattern from innermost to outer caps.
- Do not turn the camshaft when measuring clearance with the Plastigauge®.
- Remove the camshaft caps and measure the width of the Plastigauge® ①.



## 5. Measure:

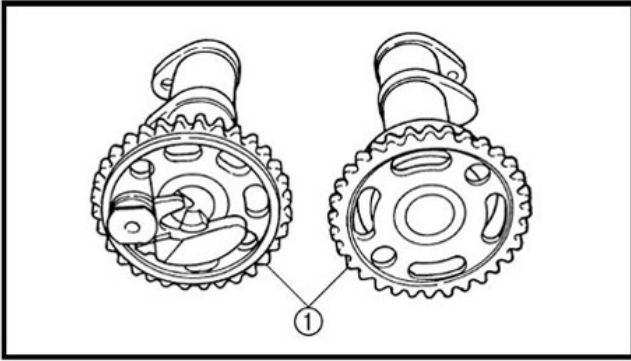
- Camshaft outside diameter (a)  
Out of specification → Replace the camshaft.  
Within specification → Replace camshaft case and camshaft caps as a set.



**Camshaft outside diameter:**  
21.959 ~ 21.972 mm  
(0.8645 ~ 0.8650 in)



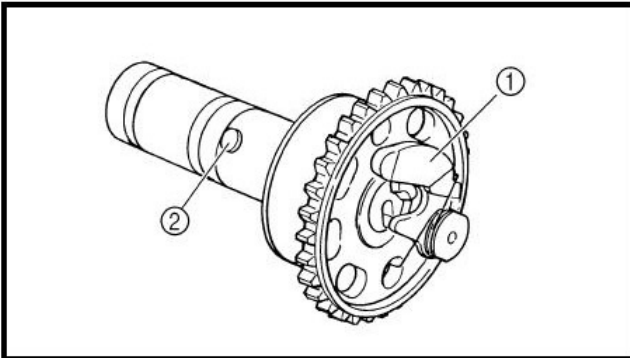
### 3.4.2 Camshaft sprocket



#### 1. Inspect:

- Camshaft sprocket ①  
Wear/damage → Replace the camshaft assembly and timing chain as a set.

### 3.4.3 Decompression system



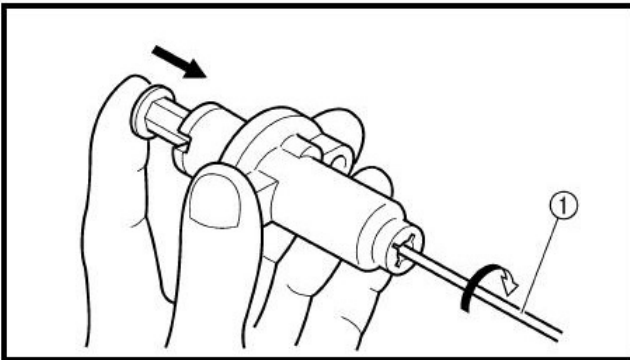
#### 1. Check:

- Decompression system

#### Checking steps:

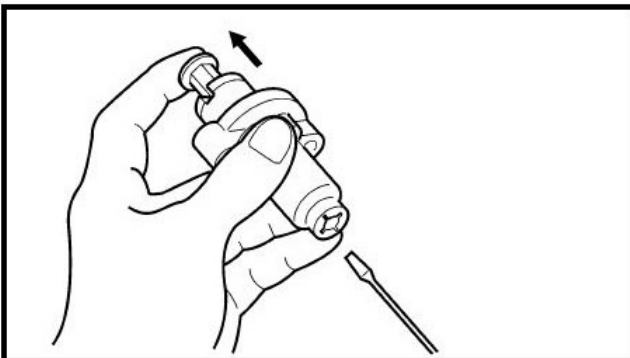
- Check that the decompression mechanism cam ① moves smoothly.
- Check that the decompression mechanism cam lever pin ② projects from the camshaft.

### 3.4.4 Timing chain tensioner



#### 1. Check:

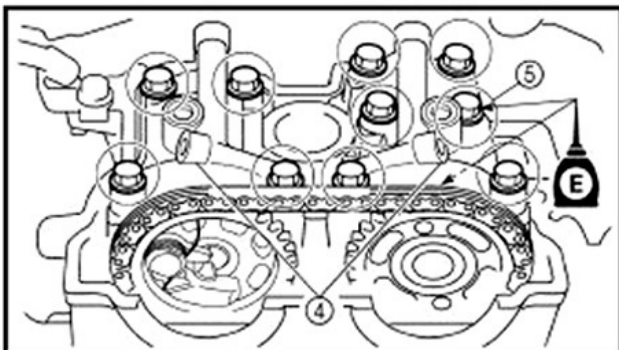
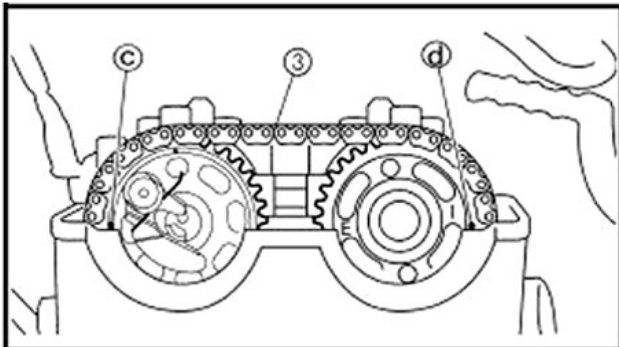
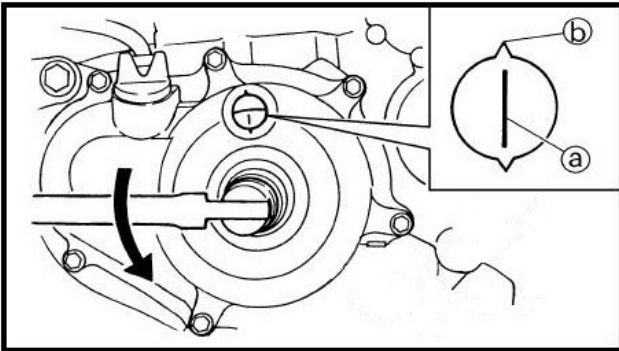
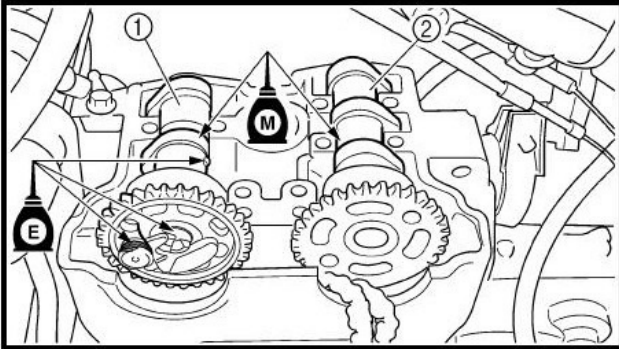
- While pressing the tensioner rod lightly with fingers, use a thin screwdriver ① and wind the tensioner rod up fully clockwise.
- When releasing the screwdriver by pressing lightly with fingers, make sure that the tensioner rod will come out smoothly.
- If not, replace the tensioner assembly.





## 3.5 Assembly and installation

### 3.5.1 Camshaft



#### 1. Install:

- Exhaust camshaft ①
- Intake camshaft ②

#### Installation steps:

- Turn the crankshaft counterclockwise with a wrench.
- NOTE:**
- Apply the molybdenum disulfide oil on the camshafts.
  - Apply the engine oil on the decompression system.
  - Squeezing the decompression lever allows the crankshaft to be turned easily.
- 
- Align the T.D.C. mark ① on the rotor with the align mark ② on the crankcase cover when piston is at T.D.C. on compression stroke.
  - Fit the timing chain ③ onto both camshaft sprockets and install the camshafts on the cylinder head.

#### NOTE:

The camshafts should be installed onto the cylinder head so that the punch mark ③ on the exhaust camshaft and the punch mark ④ on the intake camshaft must align with the cylinder head surface, as shown in the illustration.

#### CAUTION:

Do not turn the crankshaft during the camshaft installation. Damage or improper valve timing will result.

- Install the clips, camshaft caps ④ and bolts (camshaft cap) ⑤.



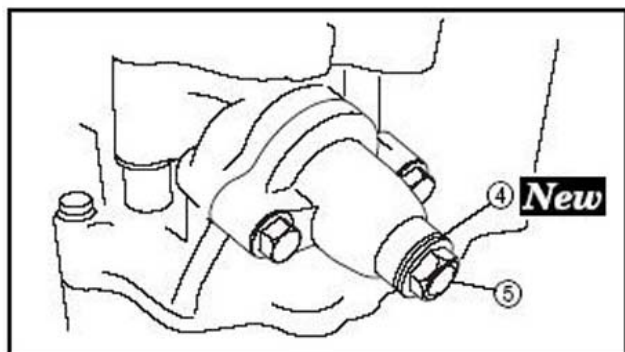
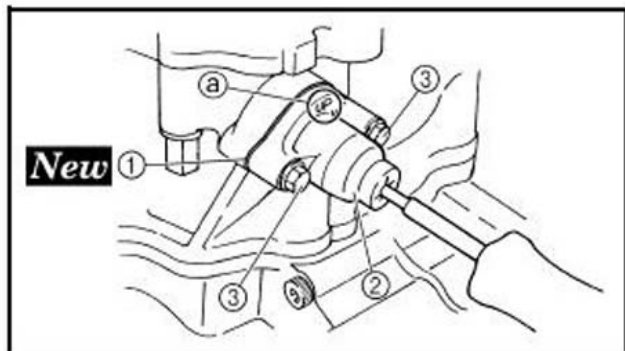
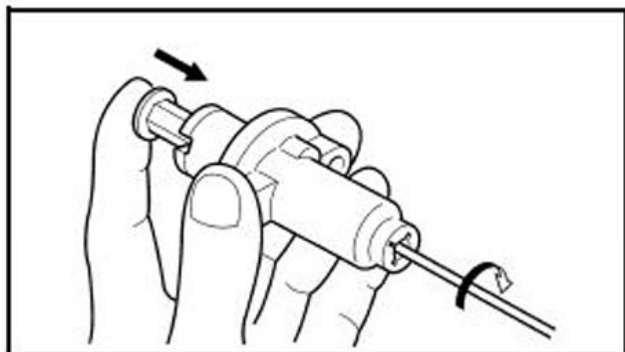
**Bolt (camshaft cap):**  
10 Nm (1.0 m • kg, 7.2 ft • lb)

**NOTE:**

- Before removing the clips, cover the cylinder head with a clean rag to prevent the clips from into the cylinder head cavity.
- Apply the engine oil on the thread and contact surface of the bolts (camshaft cap).
- Tighten the bolts (camshaft cap) in a criss-cross pattern.

**CAUTION:**

The bolts (camshaft cap) must be tightened evenly, or damage to the cylinder head, camshaft caps, and camshaft will result.



## 2. Install:

- Timing chain tensioner

**Installation steps:**

- While pressing the tensioner rod lightly with fingers, use a thin screwdriver and wind the tensioner rod up fully clockwise.
- With the rod fully wound and the chain tensioner UP mark (a) facing upward, install the gasket (1) and the timing chain tensioner (2), and tighten the bolt (3) to the specified torque.

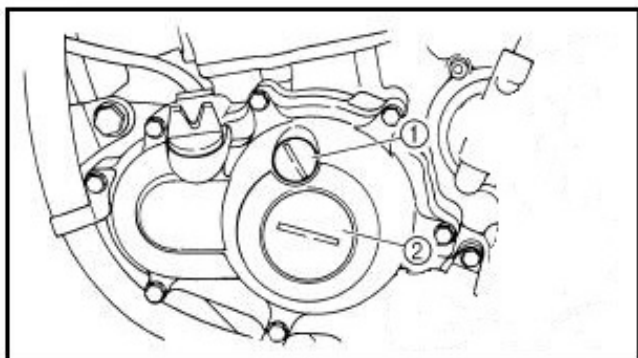


**Bolt (timing chain tensioner):**  
10 Nm (1.0 m • kg, 7.2 ft • lb)

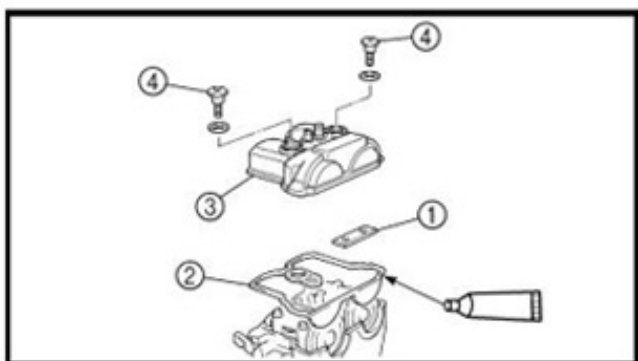
- Release the screwdriver, check the tensioner rod to come out and tighten the gasket (4) and the cap bolt (5) to the specified torque.



**Tensioner cap bolt:**  
7 Nm (0.7 m • kg, 5.1 ft • lb)



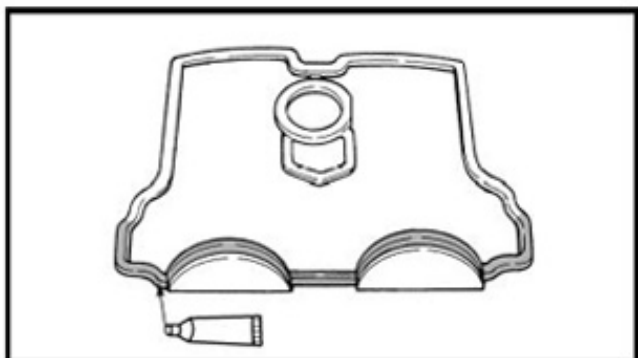
3. Turn:
  - Crankshaft  
Counterclockwise several turns.
4. Check:
  - Rotor T.D.C. mark  
Align with the crankcase align mark.
  - Camshaft match marks  
Align with the cylinder head surface.  
Out of alignment → Adjust.



5. Install:
  - Timing mark accessing screw ①
  - Crankshaft end accessing screw ②
6. Install:
  - Timing chain guide (top side) ①
  - Cylinder head cover gasket ②
  - Cylinder head cover ③
  - Bolt (cylinder head cover) ④

10 Nm (1.0 m · kg, 7.2 ft · lb)

**NOTE:** \_\_\_\_\_  
Apply the sealant on the cylinder head cover gasket.



**Quick gasket®:**  
**ACC-QUICK-GS-KT**  
**YAMAHA Bond No. 1215:**  
**90890-85505**

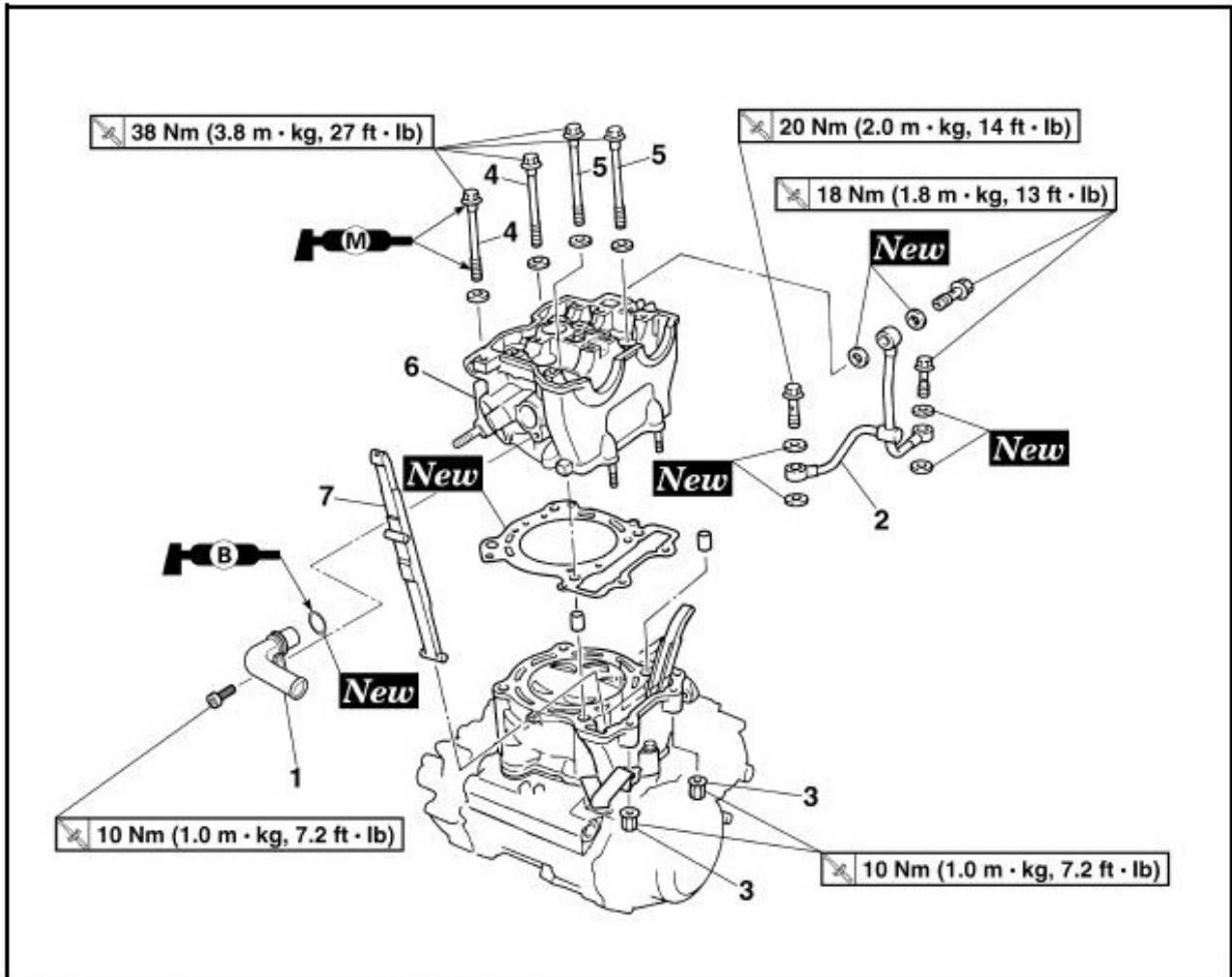
7. Install:
  - Oil tank breather hose
  - Cylinder head breather hose
  - Spark plug

13 Nm (1.3 m · kg, 9.4 ft · lb)



## 4 CYLINDER HEAD

### 4.1 Removal points

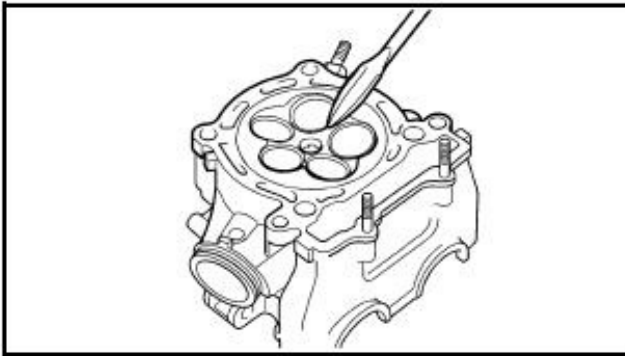


Extent of removal: ① Cylinder head removal

Extent of removal	Order	Part name	Q'ty	Remarks
Preparation for removal		<b>CYLINDER HEAD REMOVAL</b>		
		Seat and fuel tank		Refer to "SEAT, FUEL TANK AND SIDE COVERS" section.
		Exhaust pipe and silencer		Refer to "EXHAUST PIPE AND SILENCER" section.
		Radiator hose 1		Disconnect at cylinder head side.
		Carburetor		Refer to "CARBURETOR" section.
		Camshaft		Refer to "CAMSHAFTS" section.
		Upper engine bracket		Refer to "ENGINE REMOVAL" section.
①	1	Radiator pipe	1	
	2	Oil delivery pipe	1	
	3	Nut	2	
	4	Bolt [L = 135 mm (5.31 in)]	2	
	5	Bolt [L = 145 mm (5.71 in)]	2	
	6	Cylinder head	1	
	7	Timing chain guard (exhaust side)	1	



## 4.2 Inspection



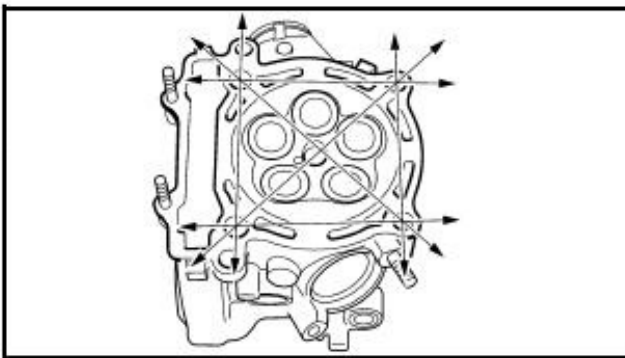
1. Eliminate:
  - Carbon deposits (from the combustion chambers)  
Use a rounded scraper.

**NOTE:** \_\_\_\_\_  
Do not use a sharp instrument to avoid damaging or scratching:

- Spark plug threads
- Valve seats

2. Inspect:
  - Cylinder head  
Scratches/damage → Replace.

3. Measure:
  - Cylinder head warpage  
Out of specification → Resurface.



**Cylinder head warpage:**  
Less than 0.05 mm (0.002 in)

### Warpage measurement and resurfacing steps:

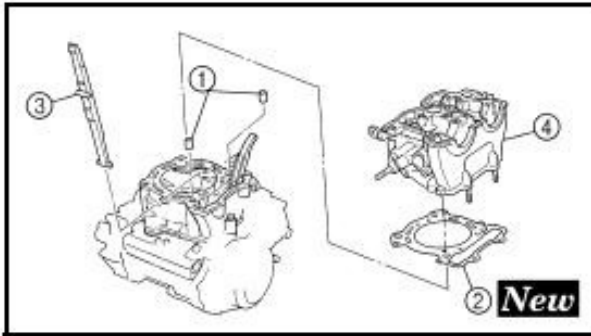
- Place a straightedge and a feeler gauge across the cylinder head.
- Use a feeler gauge to measure the warpage.
- If the warpage is out of specification, resurface the cylinder head.
- Place a 400 ~ 600 grit wet sandpaper on the surface plate, and resurface the head using a figure-eight sanding pattern.

**NOTE:** \_\_\_\_\_  
To ensure an even surface rotate the cylinder head several times.



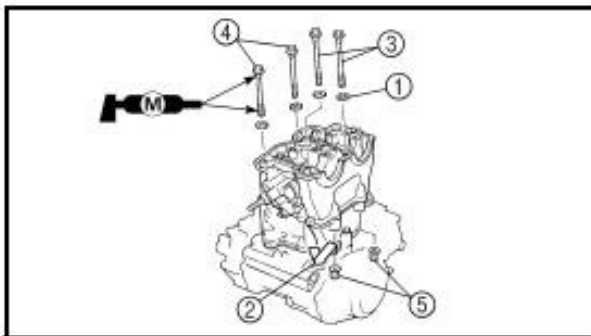
### 4.3 Assembly and installation

#### 4.3.1 Cylinder head



1. Install:
  - Dowel pin ①
  - Cylinder head gasket ② **New**
  - Timing chain guide (exhaust side) ③
  - Cylinder head ④

**NOTE:** While pulling up the timing chain, install the timing chain guide (exhaust side) and cylinder head.



2. Install:
  - Washer ①
  - Cable guide ②
  - Bolts [L = 145 mm (5.71 in)] ③
 

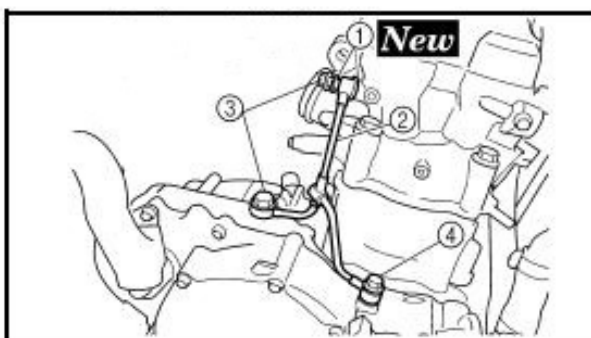
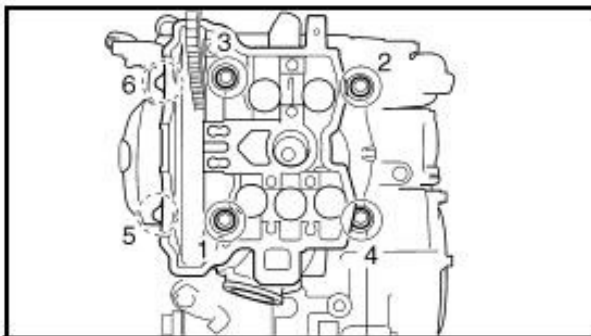
	38 Nm (3.8 m · kg, 27 ft · lb)
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  - Bolts [L = 135 mm (5.31 in)] ④
 

	38 Nm (3.8 m · kg, 27 ft · lb)
--	--------------------------------
  - Nuts ⑤
 

	10 Nm (1.0 m · kg, 7.2 ft · lb)
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**NOTE:**

- Apply the molybdenum disulfide grease on the thread and contact surface of the bolts.
- Follow the numerical order shown in the illustration. Tighten the bolts and nuts in two stages.



3. Install:
  - Copper washer ① **New**
  - Oil delivery pipe ②
  - Union bolt (M8) ③
 

	18 Nm (1.8 m · kg, 13 ft · lb)
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  - Union bolt (M10) ④
 

	20 Nm (2.0 m · kg, 14 ft · lb)
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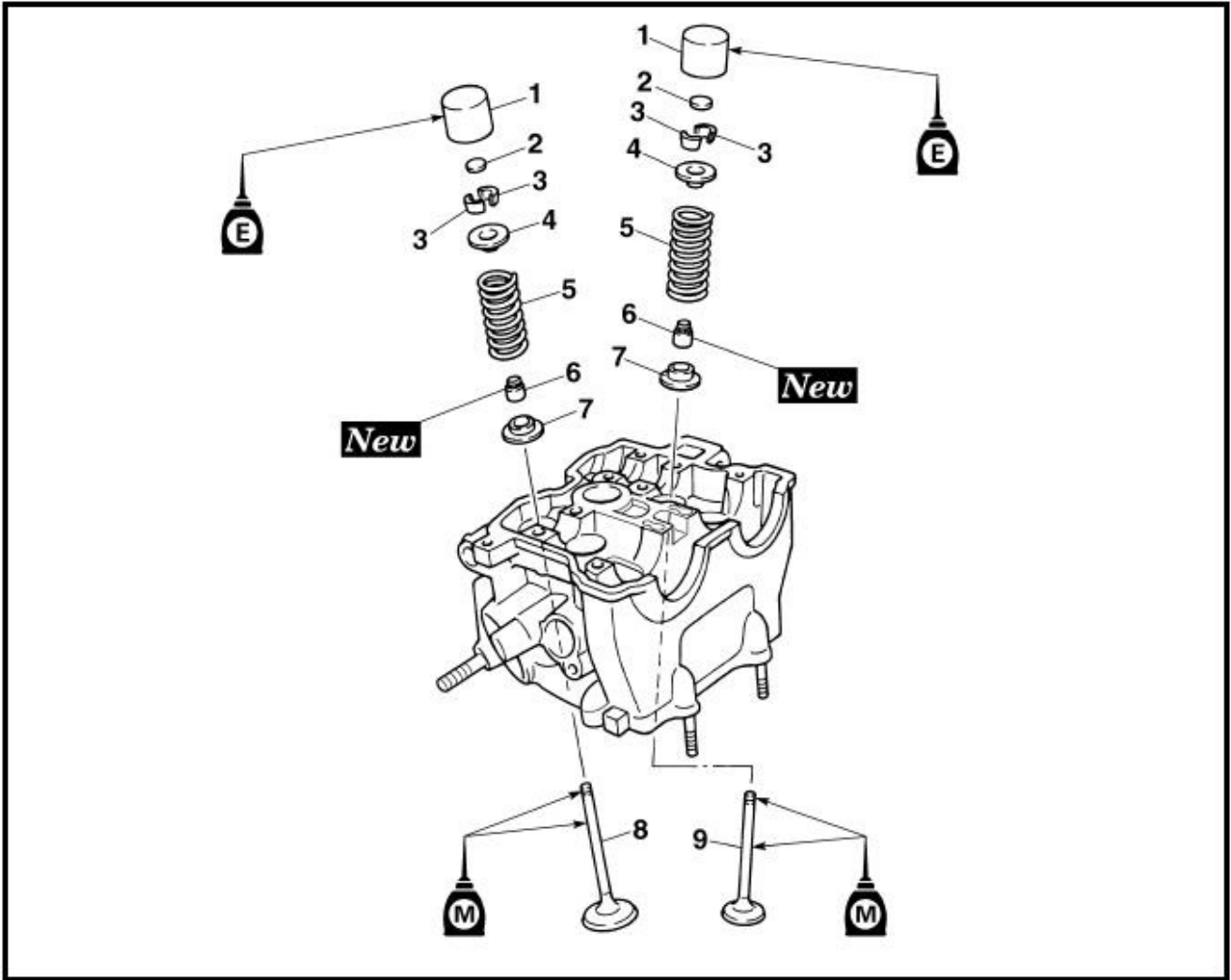
4. Install:
  - Radiator pipe ①
  - Bolt (radiator pipe) ②
 

	10 Nm (1.0 m · kg, 7.2 ft · lb)
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## 5 VALVES AND VALVE SPRINGS



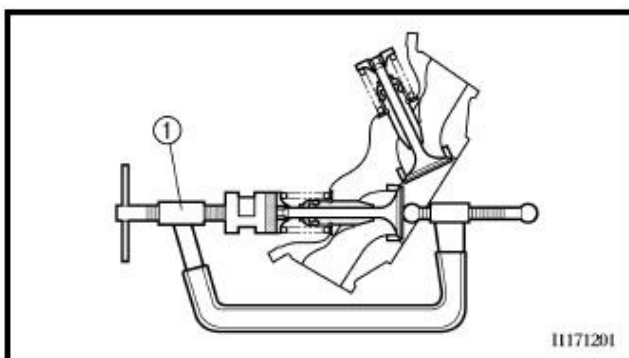
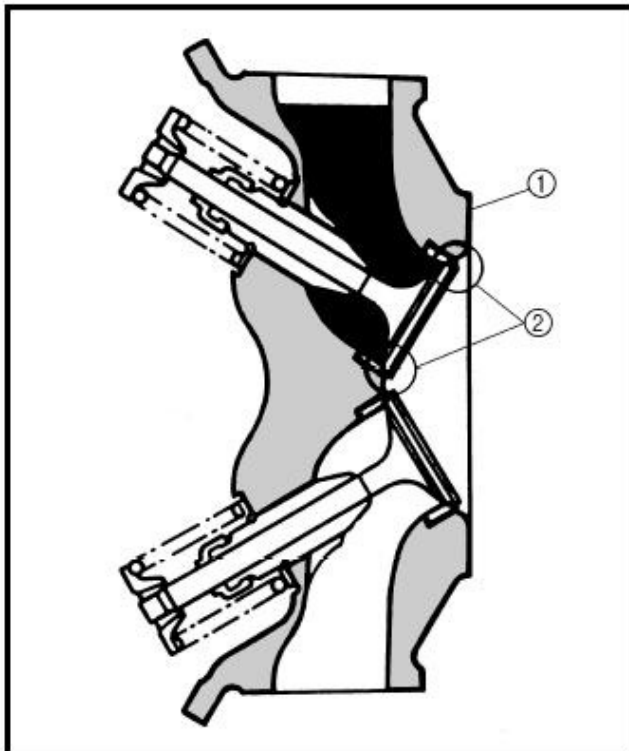
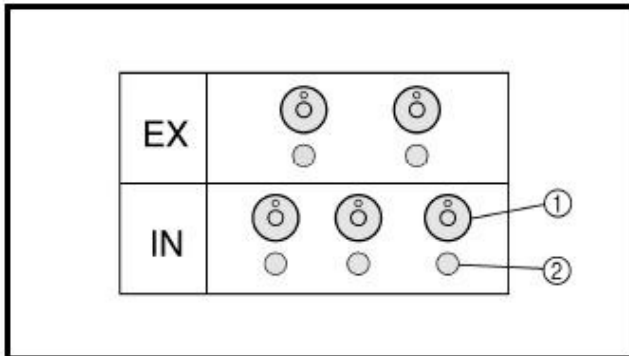
Extent of removal: ① Valve removal

Extent of removal	Order	Part name	Q'ty	Remarks
		<b>VALVES AND VALVE SPRINGS REMOVAL</b>		
Preparation for removal		Cylinder head		Refer to "CYLINDER HEAD" section.
①	1	Valve lifter	5	Use special tool. Refer to "REMOVAL POINTS".
	2	Adjusting pad	5	
	3	Valve cotter	10	
	4	Valve spring retainer	5	
	5	Valve spring	5	
	6	Valve stem seal	5	
	7	Valve spring seat	5	
	8	Exhaust valve	2	
	9	Intake valve	3	



## 5.1 Removal points

### 5.1.1 Valve lifter and valve cotter



### REMOVAL POINTS

#### Valve lifter and valve cotter

- Remove:
  - Valve lifter ①
  - Pad ②

#### NOTE:

Identify each lifter ① and pad ② position very carefully so that they can be reinstalled in their original place.

- Check:
  - Valve sealing  
Leakage at the valve seat → Inspect the valve face, valve seat and valve seat width.

#### Checking steps:

- Pour a clean solvent ① into the intake and exhaust ports.
- Check that the valve seals properly. There should be no leakage at the valve seat ②.

- Remove:
  - Valve cotter

#### NOTE:

Attach a valve spring compressor ① between the valve spring retainer and the cylinder head to remove the valve cottes.

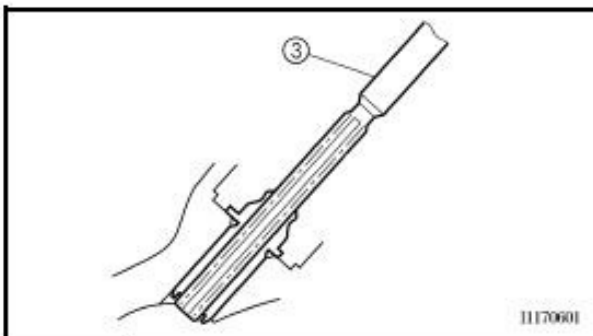
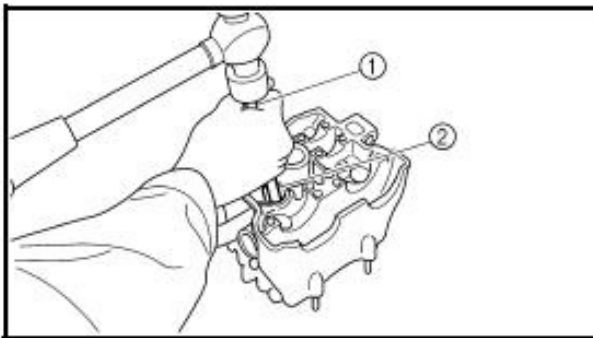
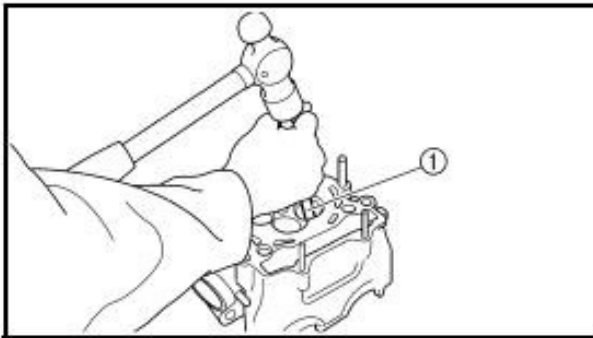
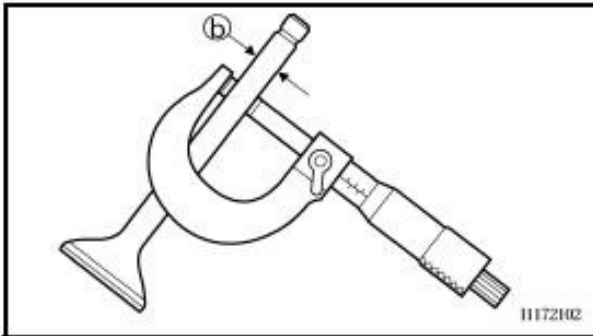
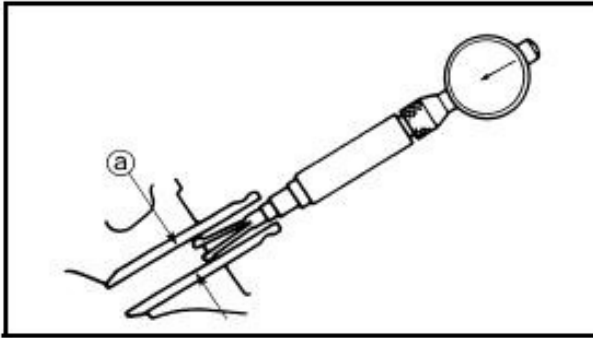


Valve spring compressor:  
YM-4019/90890-04019



## 5.2 Inspection

### 5.2.1 Valve



#### 1. Measure:

- Stem-to-guide clearance

**Stem-to-guide clearance =**  
 valve guide inside diameter (a) –  
 valve stem diameter (b)

Out of specification → Replace the valve guide.



#### Clearance (stem to guide):

##### Intake:

0.010 ~ 0.037 mm  
 (0.0004 ~ 0.0015 in)  
 <Limit>: 0.08 mm (0.003 in)

##### Exhaust:

0.025 ~ 0.052 mm  
 (0.0010 ~ 0.0020 in)  
 <Limit>: 0.10 mm (0.004 in)

#### 2. Replace:

- Valve guide

#### Replacement steps:

##### NOTE:

To ease guide removal, installation and to maintain correct fit heat the cylinder head in an oven to 100 °C (212 °F).

- Remove the valve guide using a valve guide remover (1).
- Install the new valve guide using a valve guide remover (1) and valve guide installer (2).
- After installing the valve guide, bore the valve guide using a valve guide reamer (3) to obtain proper stem-to-guide clearance.



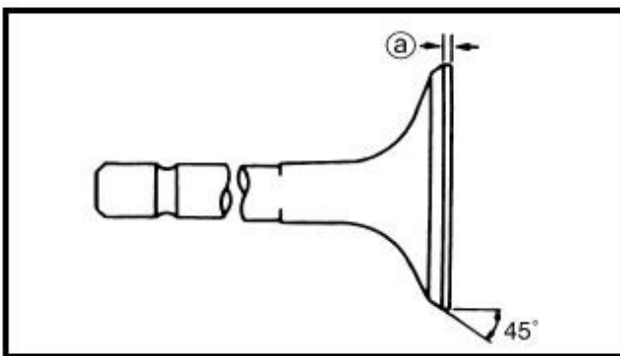
**Valve guide remover:**  
 Intake: 4.0 mm (0.16 in)  
 YM-4111/90890-04111  
 Exhaust: 4.5 mm (0.18 in)  
 YM-4116/90890-04116

**Valve guide installer:**  
 Intake: 4.0 mm (0.16 in)  
 YM-4112/90890-04112  
 Exhaust: 4.5 mm (0.18 in)  
 YM-4117/90890-04117

**Valve guide reamer:**  
 Intake: 4.0 mm (0.16 in)  
 YM-4113/90890-04113  
 Exhaust: 4.5 mm (0.18 in)  
 YM-4118/90890-04118

**NOTE:** \_\_\_\_\_  
 After replacing the valve guide reface the valve seat.

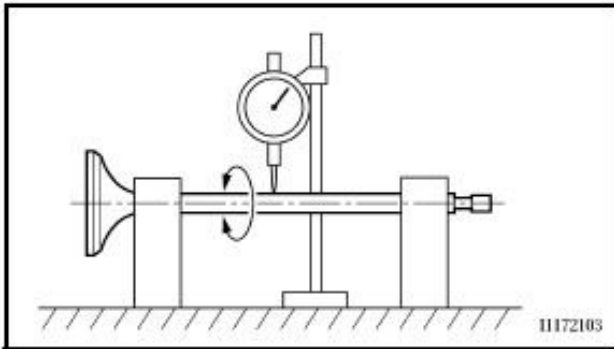
3. Inspect:
- Valve face  
Pitting/wear → Grind the face.
  - Valve stem end  
Mushroom shape or diameter larger than the body of the stem → Replace.



4. Measure:
- Margin thickness (a)  
Out of specification → Replace.



**Margin thickness:**  
 Intake:  
 0.8 mm (0.0315 in)  
 Exhaust:  
 0.7 mm (0.0276 in)



5. Measure:
- Runout (valve stem)  
Out of specification → Replace.

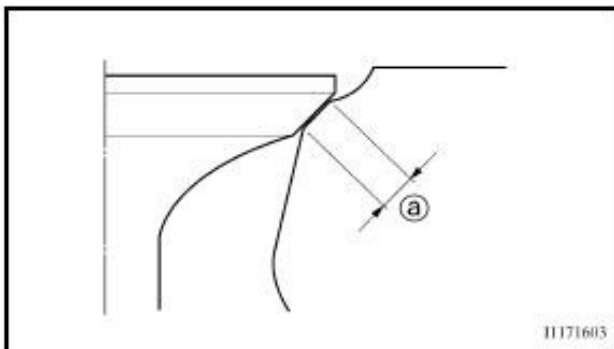


**Runout limit:**  
0.01 mm (0.0004 in)

**NOTE:**

- When installing a new valve always replace the guide.
- If the valve is removed or replaced always replace the oil seal.

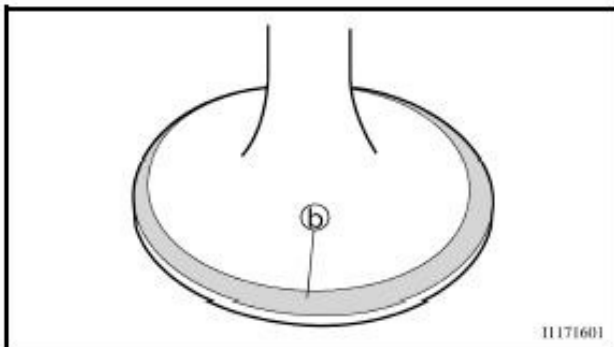
6. Eliminate:
- Carbon deposits  
(from the valve face and valve seat)
7. Inspect:
- Valve seat  
Pitting/wear → Reface the valve seat.



8. Measure:
- Valve seat width (a)  
Out of specification → Reface the valve seat.



**Valve seat width:**  
**Intake:**  
0.9 - 1.1 mm  
(0.0354 - 0.0433 in)  
<Limit>: 1.6 mm (0.0630 in)  
**Exhaust:**  
0.9 - 1.1 mm  
(0.0354 - 0.0433 in)  
<Limit>: 1.6 mm (0.0630 in)



**Measurement steps:**

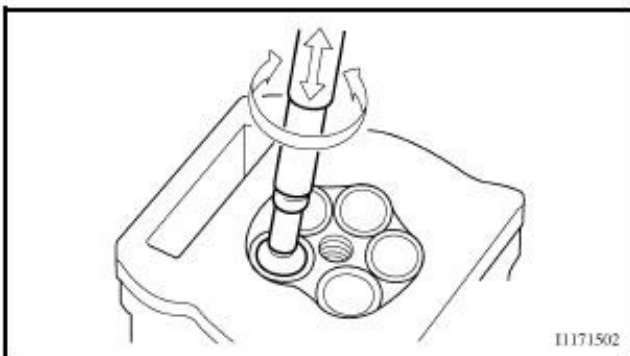
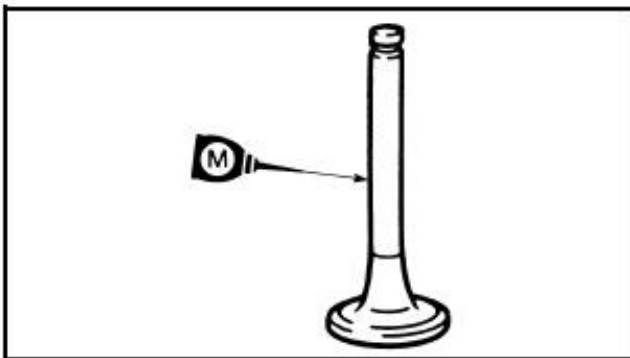
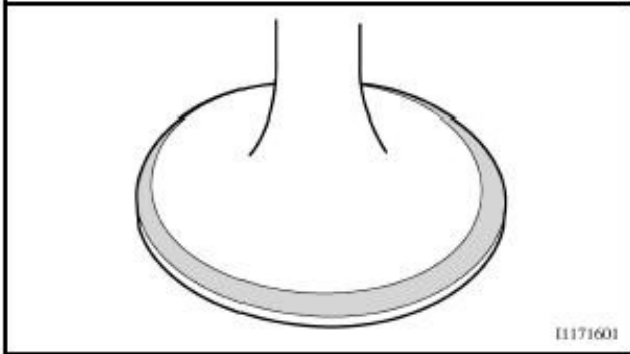
- Apply Mechanic's blueing dye (Dykem) (b) to the valve face.
- Install the valve into the cylinder head.
- Press the valve through the valve guide and onto the valve seat to make a clear pattern.
- Measure the valve seat width. Where the valve seat and valve face made contact, blueing will have been removed.
- If the valve seat is too wide, too narrow, or the seat is not centered, the valve seat must be refaced.



9. Lap:
- Valve face
  - Valve seat

**NOTE:**

After refacing the valve seat or replacing the valve and valve guide, the valve seat and valve face should be lapped.

**Lapping steps:**

- Apply a coarse lapping compound to the valve face.

**CAUTION:**

**Do not let the compound enter the gap between the valve stem and the guide.**

- Apply molybdenum disulfide oil to the valve stem.
- Install the valve into the cylinder head.
- Turn the valve until the valve face and valve seat are evenly polished, then clean off all of the compound.

**NOTE:**

For best lapping results, lightly tap the valve seat while rotating the valve back and forth between your hands.

- Apply a fine lapping compound to the valve face and repeat the above steps.

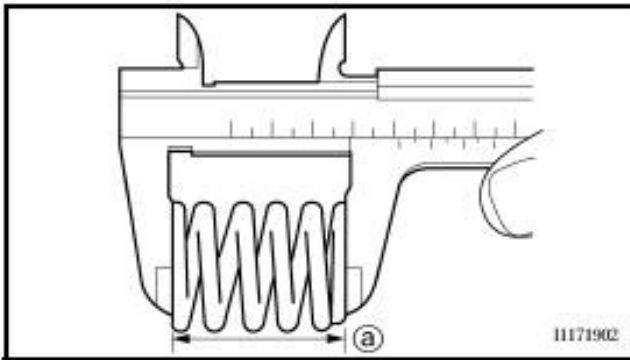
**NOTE:**

After every lapping operation be sure to clean off all of the compound from the valve face and valve seat.


- Apply Mechanic's blueing dye (Dykem) to the valve face.
- Install the valve into the cylinder head.
- Press the valve through the valve guide and onto the valve seat to make a clear pattern.
- Measure the valve seat width again. If the valve seat width is out of specification, reface and relap the valve seat.

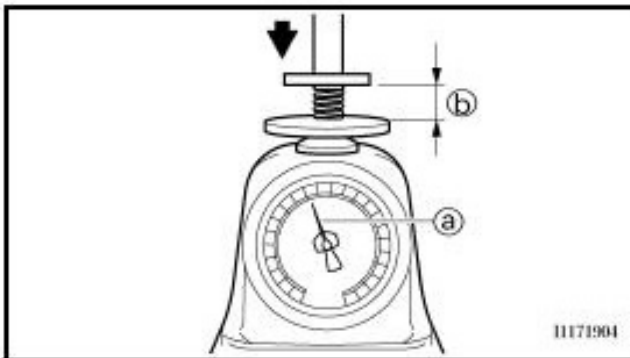


5.2.2 Valve spring




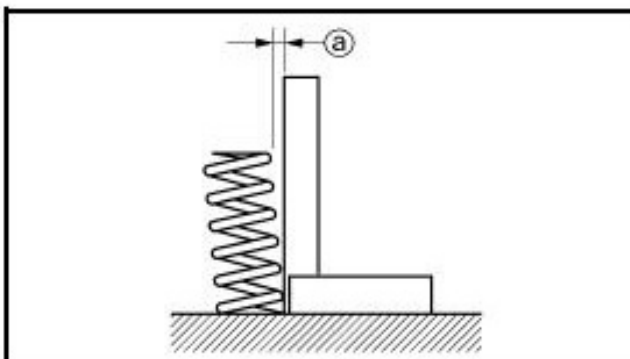
1. Measure:
  - Valve spring free length (a)  
Out of specification → Replace.

 **Free length (valve spring):**  
**Intake:**  
 37.81 mm (1.49 in)  
 <Limit>: 36.81 mm (1.45 in)  
**Exhaust:**  
 37.54 mm (1.48 in)  
 <Limit>: 36.54 mm (1.44 in)




2. Measure:
    - Compressed spring force (a)  
Out of specification → Replace.
- (b) Installed length

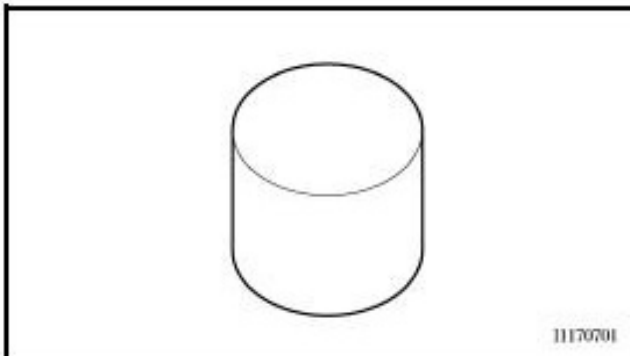
 **Compressed spring force:**  
**Intake:**  
 99 ~ 114 N at 29.13 mm  
 (9.9 ~ 11.4 kg at 29.13 mm,  
 22.27 ~ 25.57 lb at 1.15 in)  
**Exhaust:**  
 126 ~ 144 N at 29.30 mm  
 (12.6 ~ 14.4 kg at 29.30 mm,  
 28.44 ~ 32.41 lb at 1.15 in)



3. Measure:
  - Spring tilt (a)  
Out of specification → Replace.

 **Spring tilt limit:**  
**Intake:**  
 2.5°/1.7 mm (0.067 in)  
**Exhaust:**  
 2.5°/1.6 mm (0.063 in)

5.2.3 Valve lifter



1. Inspect:
  - Valve lifter  
Scratches/damage → Replace both lifters and cylinder head.



### 5.3 Valve clearance inspection and adjustment

#### NOTE:

- The valve clearance should be adjusted when the engine is cool to the touch.
- The piston must be at Top Dead Center (T.D.C.) on compression stroke to check or adjust the valve clearance.

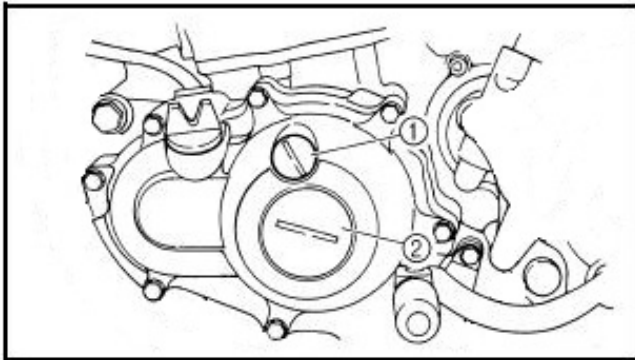
#### 1. Drain:

- Coolant

Refer to "COOLANT REPLACEMENT" section.

#### 2. Remove:

- Timing mark accessing screw ①
- Crankshaft end accessing screw ②
- O-ring



#### 3. Check:

- Valve clearance  
Out of specification → Adjust.



#### Valve clearance (cold):

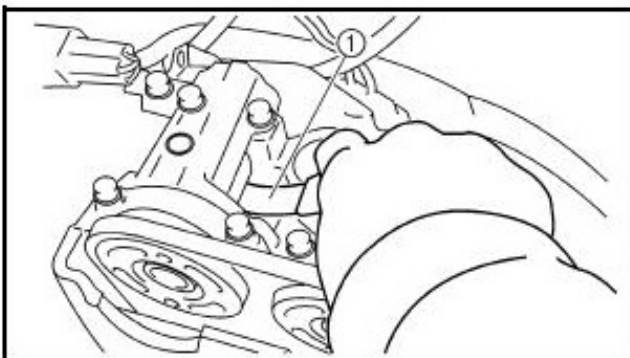
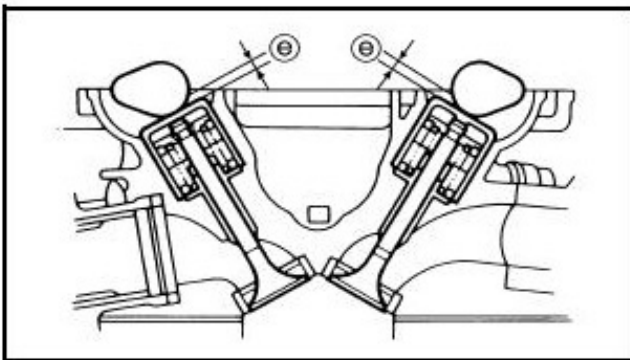
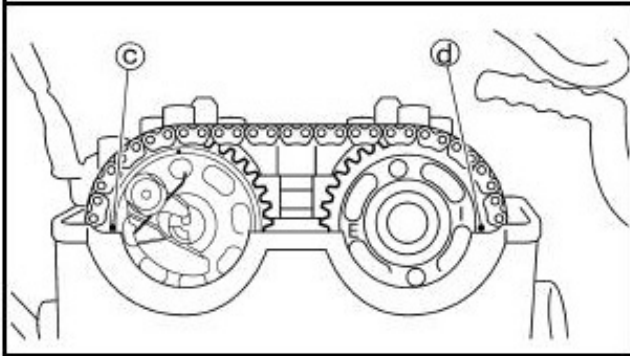
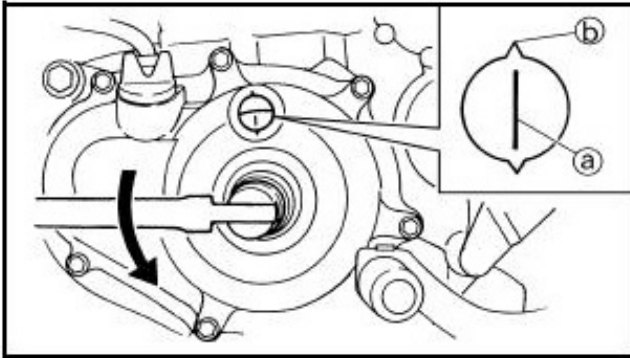
##### Intake valve:

0.10 ~ 0.15 mm  
(0.0039 ~ 0.0059 in)

##### Exhaust valve:

0.17 ~ 0.22 mm  
(0.0067 ~ 0.0087 in)



**Checking steps:**

- Turn the crankshaft counterclockwise with a wrench.
- Align the T.D.C. mark (a) on the rotor with the align mark (b) on the crankcase cover when piston is at T.D.C. on compression stroke.

**NOTE:**

In order to be sure that the piston is at Top Dead Center, the punch mark (c) on the exhaust camshaft and the punch mark (d) on the intake camshaft must align with the cylinder head surface, as shown in the illustration.

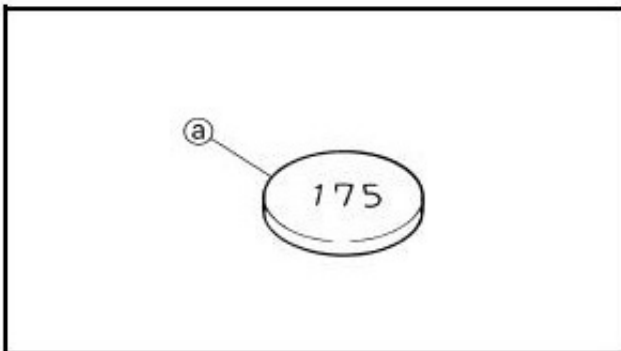
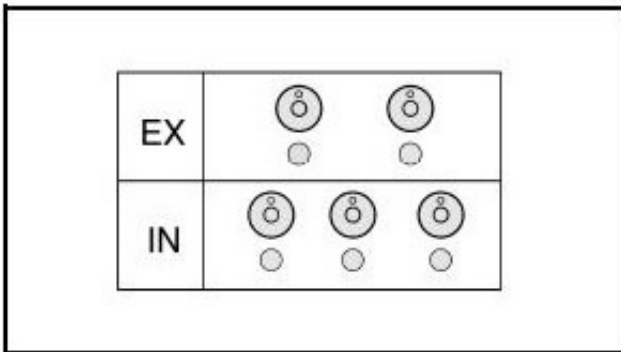
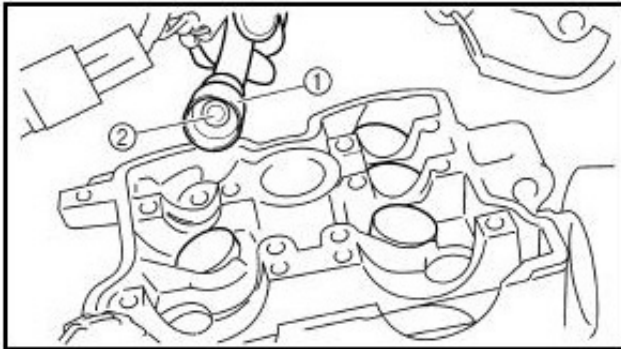
- Measure the valve clearance (e) using a feeler gauge (1).

**NOTE:**

Record the measured reading if the clearance is incorrect.



4. Adjust:
- Valve clearance



**Adjustment steps:**

- Remove the camshaft (intake and exhaust).  
Refer to "CAMSHAFTS" section
- Remove the valve lifters ① and the pads ②.

**NOTE:**

- Place a rag in the timing chain space to prevent pads from falling into the crankcase.
- Identity each valve lifter and pad position very carefully so that they can be reinstalled in their original place.
- Select the proper pad using the pad selecting table.

Pad range		Pad Availability: 25 increments
No. 120 ~ No. 240	1.20 mm ~ 2.40 mm	Pads are available in 0.05 mm increments

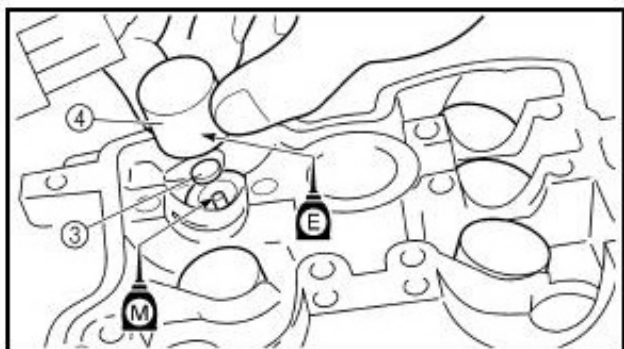
**NOTE:**

The thickness ① of each pad is indicated in hundredths of millimeters on the pad upper surface.

- Round off the last digit of the installed pad number to the nearest increment.

Last digit of pad number	Rounded value
0, 1 or 2	0
4, 5 or 6	5
8 or 9	10

**EXAMPLE:**  
 Installed pad number = 148  
 Rounded off value = 150

**NOTE:**

Pads can only be selected in 0.05 mm increments.

- Locate the rounded-off value and the measured valve clearance in the chart "PAD SELECTION TABLE". The field where these two coordinates intersect shows the new pad number to use.

**NOTE:**

Use the new pad number only as a guide when verifying the valve clearance adjustment.

- Install the new pads ③ and the valve lifters ④.

**NOTE:**

- Apply the engine oil on the valve lifters.
- Apply the molybdenum disulfide oil on the valve stem ends.

• Valve lifter must turn smoothly when rotated with a finger.

- Be careful to reinstall valve lifters and pads in their original place.

- Install the camshafts (exhaust and intake). Refer to "CAMSHAFTS" section



**INTAKE**

MEASURED CLEARANCE	INSTALLED PAD NUMBER																										
	120	125	130	135	140	145	150	155	160	165	170	175	180	185	190	195	200	205	210	215	220	225	230	235	240		
0.00 ~ 0.04			120	125	130	135	140	145	150	155	160	165	170	175	180	185	190	195	200	205	210	215	220	225	230	235	240
0.05 ~ 0.09		120	125	130	135	140	145	150	155	160	165	170	175	180	185	190	195	200	205	210	215	220	225	230	235	240	
0.10 ~ 0.15	STANDARD CLEARANCE																										
0.16 ~ 0.20	125	130	135	140	145	150	155	160	165	170	175	180	185	190	195	200	205	210	215	220	225	230	235	240			
0.21 ~ 0.25	130	135	140	145	150	155	160	165	170	175	180	185	190	195	200	205	210	215	220	225	230	235	240				
0.26 ~ 0.30	135	140	145	150	155	160	165	170	175	180	185	190	195	200	205	210	215	220	225	230	235	240					
0.31 ~ 0.35	140	145	150	155	160	165	170	175	180	185	190	195	200	205	210	215	220	225	230	235	240						
0.36 ~ 0.40	145	150	155	160	165	170	175	180	185	190	195	200	205	210	215	220	225	230	235	240							
0.41 ~ 0.45	150	155	160	165	170	175	180	185	190	195	200	205	210	215	220	225	230	235	240								
0.46 ~ 0.50	155	160	165	170	175	180	185	190	195	200	205	210	215	220	225	230	235	240									
0.51 ~ 0.55	160	165	170	175	180	185	190	195	200	205	210	215	220	225	230	235	240										
0.56 ~ 0.60	165	170	175	180	185	190	195	200	205	210	215	220	225	230	235	240											
0.61 ~ 0.65	170	175	180	185	190	195	200	205	210	215	220	225	230	235	240												
0.66 ~ 0.70	175	180	185	190	195	200	205	210	215	220	225	230	235	240													
0.71 ~ 0.75	180	185	190	195	200	205	210	215	220	225	230	235	240														
0.76 ~ 0.80	185	190	195	200	205	210	215	220	225	230	235	240															
0.81 ~ 0.85	190	195	200	205	210	215	220	225	230	235	240																
0.86 ~ 0.90	195	200	205	210	215	220	225	230	235	240																	
0.91 ~ 0.95	200	205	210	215	220	225	230	235	240																		
0.96 ~ 1.00	205	210	215	220	225	230	235	240																			
1.01 ~ 1.05	210	215	220	225	230	235	240																				
1.06 ~ 1.10	215	220	225	230	235	240																					
1.11 ~ 1.15	220	225	230	235	240																						
1.16 ~ 1.20	225	230	235	240																							
1.21 ~ 1.25	230	235	240																								
1.26 ~ 1.30	235	240																									
1.31 ~ 1.35	240																										

VALVE CLEARANCE (cold):  
 0.10 ~ 0.15 mm  
 Example: Installed is 175  
 Measured clearance is 0.23 mm  
 Replace 175 pad with 185 pad  
 Pad number: (example)  
 Pad No. 175 = 1.75 mm  
 Pad No. 185 = 1.85 mm

**EXHAUST**

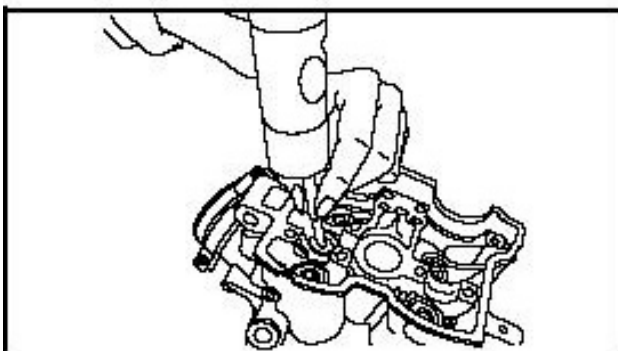
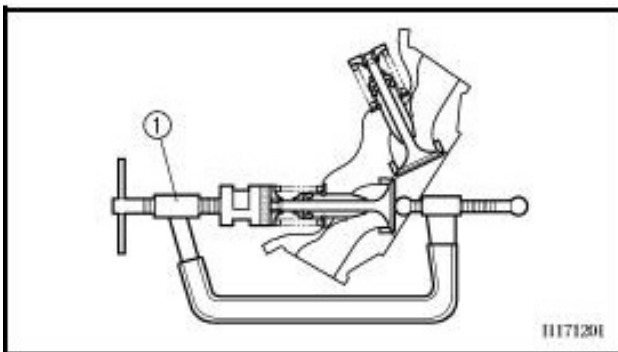
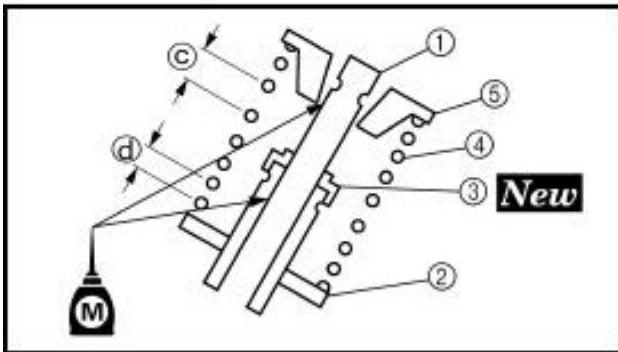
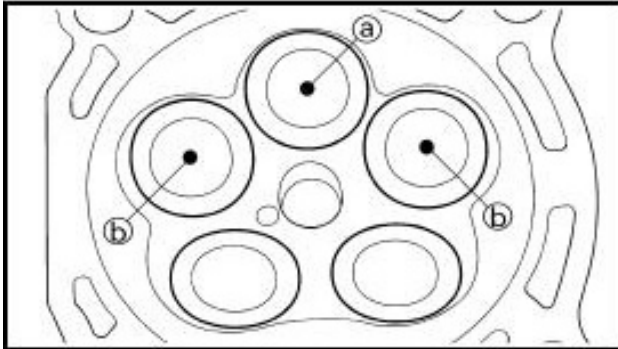
MEASURED CLEARANCE	INSTALLED PAD NUMBER																											
	120	125	130	135	140	145	150	155	160	165	170	175	180	185	190	195	200	205	210	215	220	225	230	235	240			
0.00 ~ 0.04				120	125	130	135	140	145	150	155	160	165	170	175	180	185	190	195	200	205	210	215	220	225	230	235	240
0.05 ~ 0.09			120	125	130	135	140	145	150	155	160	165	170	175	180	185	190	195	200	205	210	215	220	225	230	235	240	
0.10 ~ 0.16		120	125	130	135	140	145	150	155	160	165	170	175	180	185	190	195	200	205	210	215	220	225	230	235	240		
0.17 ~ 0.22	STANDARD CLEARANCE																											
0.23 ~ 0.25	125	130	135	140	145	150	155	160	165	170	175	180	185	190	195	200	205	210	215	220	225	230	235	240				
0.26 ~ 0.30	130	135	140	145	150	155	160	165	170	175	180	185	190	195	200	205	210	215	220	225	230	235	240					
0.31 ~ 0.35	135	140	145	150	155	160	165	170	175	180	185	190	195	200	205	210	215	220	225	230	235	240						
0.36 ~ 0.40	140	145	150	155	160	165	170	175	180	185	190	195	200	205	210	215	220	225	230	235	240							
0.41 ~ 0.45	145	150	155	160	165	170	175	180	185	190	195	200	205	210	215	220	225	230	235	240								
0.46 ~ 0.50	150	155	160	165	170	175	180	185	190	195	200	205	210	215	220	225	230	235	240									
0.51 ~ 0.55	155	160	165	170	175	180	185	190	195	200	205	210	215	220	225	230	235	240										
0.56 ~ 0.60	160	165	170	175	180	185	190	195	200	205	210	215	220	225	230	235	240											
0.61 ~ 0.65	165	170	175	180	185	190	195	200	205	210	215	220	225	230	235	240												
0.66 ~ 0.70	170	175	180	185	190	195	200	205	210	215	220	225	230	235	240													
0.71 ~ 0.75	175	180	185	190	195	200	205	210	215	220	225	230	235	240														
0.76 ~ 0.80	180	185	190	195	200	205	210	215	220	225	230	235	240															
0.81 ~ 0.85	185	190	195	200	205	210	215	220	225	230	235	240																
0.86 ~ 0.90	190	195	200	205	210	215	220	225	230	235	240																	
0.91 ~ 0.95	195	200	205	210	215	220	225	230	235	240																		
0.96 ~ 1.00	200	205	210	215	220	225	230	235	240																			
1.01 ~ 1.05	205	210	215	220	225	230	235	240																				
1.06 ~ 1.10	210	215	220	225	230	235	240																					
1.11 ~ 1.15	215	220	225	230	235	240																						
1.16 ~ 1.20	220	225	230	235	240																							
1.21 ~ 1.25	225	230	235	240																								
1.26 ~ 1.30	230	235	240																									
1.31 ~ 1.35	235	240																										
1.36 ~ 1.40	240																											

VALVE CLEARANCE (cold):  
 0.17 ~ 0.22 mm  
 Example: Installed is 175  
 Measured clearance is 0.27 mm  
 Replace 175 pad with 185 pad  
 Pad number: (example)  
 Pad No. 175 = 1.75 mm  
 Pad No. 185 = 1.85 mm



## 5.4 Assembly and installation

### 5.4.1 Valve and valve spring



1. Apply:
  - Molybdenum disulfide oil  
Onto the valve stem and valve stem seal.

2. Install:
  - Valve ①
  - Valve spring seat ②
  - Valve stem seal ③ **New**
  - Valve spring ④
  - Valve spring retainer ⑤
 To cylinder head.

**NOTE:** \_\_\_\_\_

- Make sure that each valve is installed in its original place, also referring to the painted color as follows.

Intake (middle) ①: yellow

Intake (right/left) ②: white

Exhaust: no paint

- Install the valve springs with the larger pitch ③ facing upward.

④ Smaller pitch

3. Install:
  - Valve cotter

**NOTE:** \_\_\_\_\_

While compressing the valve spring with a valve spring compressor ① install the valve cotters.

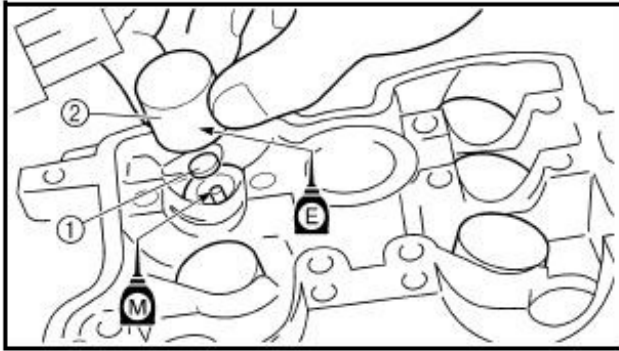


**Valve spring compressor:**  
YM-4019/90890-04019

4. To secure the valve cotters onto the valve stem, lightly tap the valve tip with a piece of wood.

**CAUTION:** \_\_\_\_\_

Hitting the valve tip with excessive force could damage the valve.



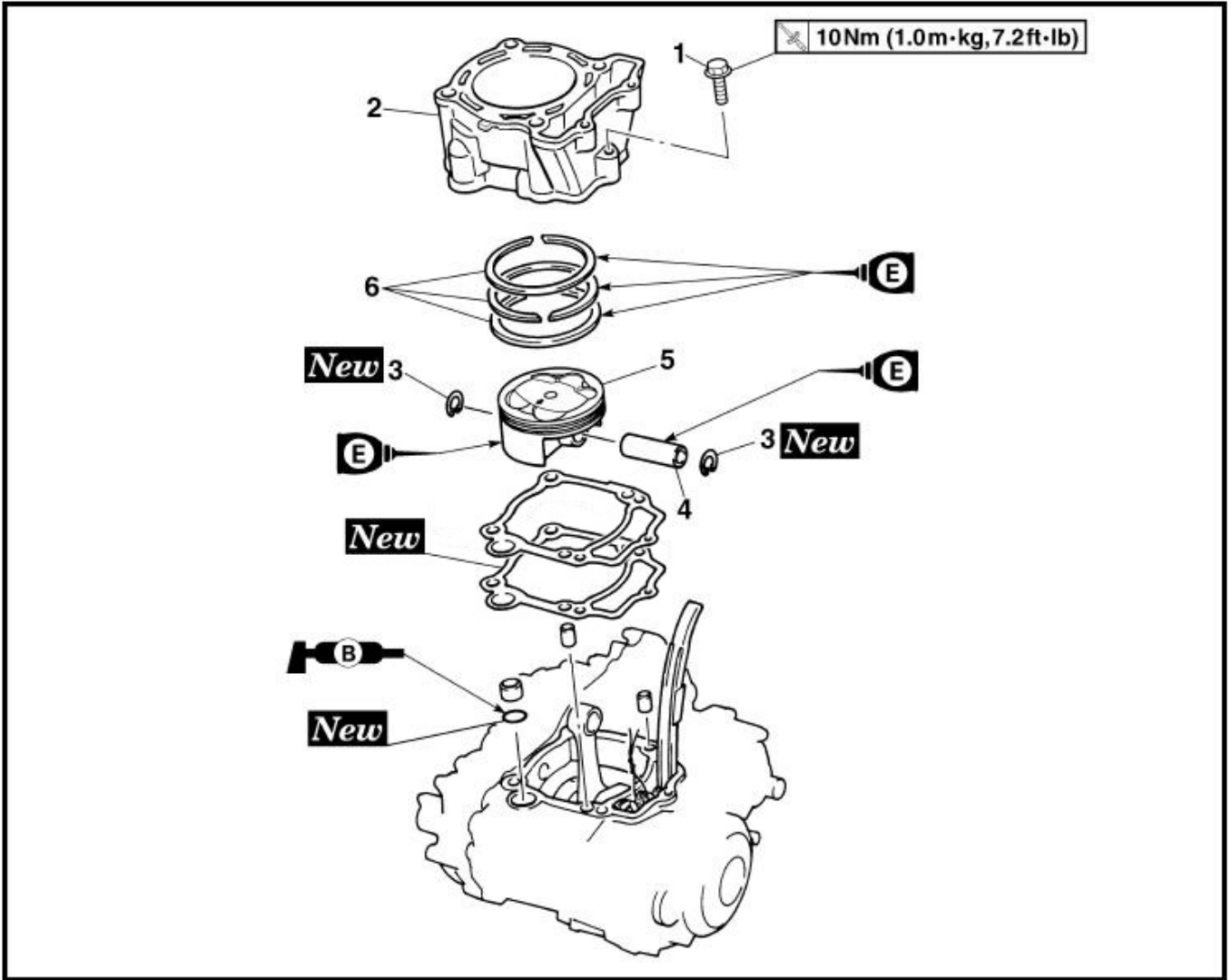
5. Install:
- Adjusting pad ①
  - Valve lifter ②

**NOTE:**

- Apply the molybdenum disulfide oil on the valve stem end.
- Apply the engine oil on the valve lifters.
- Valve lifter must turn smoothly when rotated with a finger.
- Be careful to reinstall valve lifters and pads in their original place.



## 6 CYLINDER AND PISTON



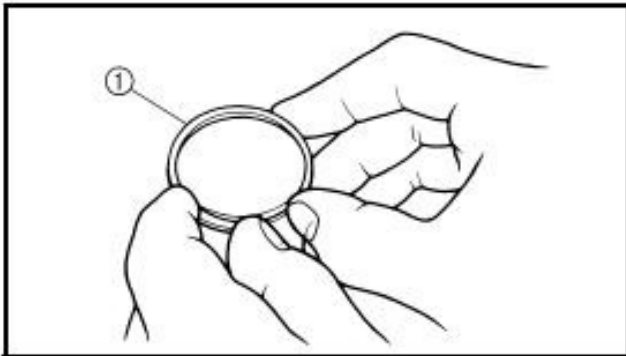
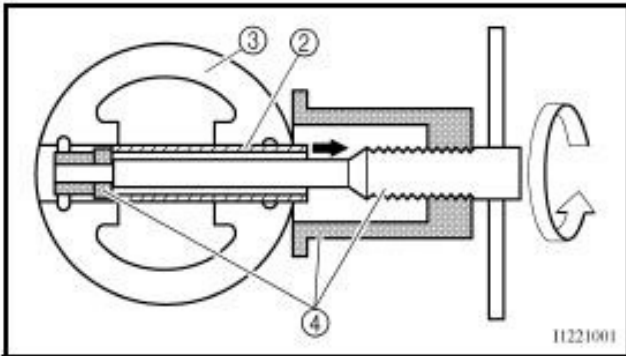
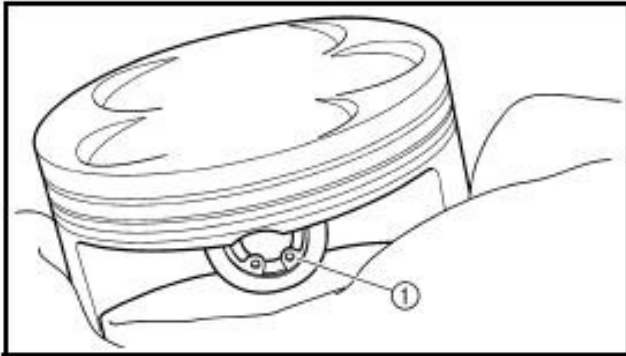
Extent of removal:                      ① Cylinder removal                      ② Piston removal

Extent of removal	Order	Part name	Q'ty	Remarks
<b>CYLINDER AND PISTON REMOVAL</b>				
Preparation for removal		Cylinder head		Refer to "CYLINDER HEAD" section.
<div style="display: flex; justify-content: space-around; align-items: center;"> <div style="text-align: center;">             ① ↑ ↓           </div> <div style="text-align: center;">             ② ↑ ↓           </div> </div>	1	Bolt (cylinder)	1	Use special tool. Refer to "REMOVAL POINTS".
	2	Cylinder	1	
	3	Piston pin clip	2	
	4	Piston pin	1	
	5	Piston	1	
	6	Piston ring set	1	



## 6.1 Removal points

### 6.1.1 Piston and piston ring



#### 1. Remove:

- Piston pin clip ①
- Piston pin ②
- Piston ③

#### NOTE:

- Put identification marks on each piston head for reference during reinstallation.
- Before removing each piston pin, deburr the clip groove and pin hole area. If the piston pin groove is deburred and the piston pin is still difficult to remove, use the piston pin puller set ④.



Piston pin puller set:  
YU-1304/90890-01304

#### CAUTION:

Do not use a hammer to drive the piston pin out.

#### 2. Remove:

- Piston ring ①

#### NOTE:

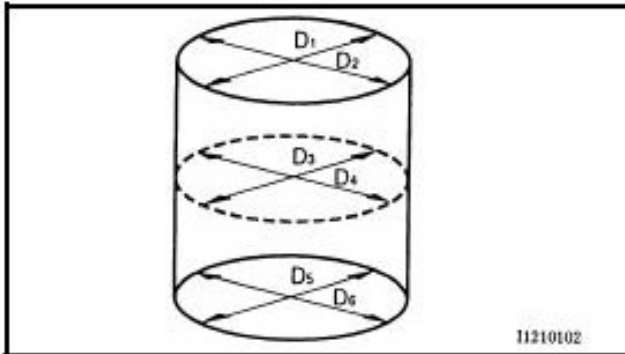
Spread the end gaps apart while at the same time lifting the piston ring over the top of the piston crown, as shown in the illustration.





## 6.2 Inspection

### 6.2.1 Cylinder and piston



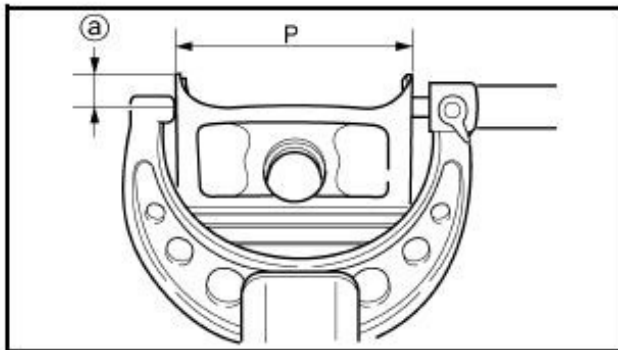
1. Inspect:
  - Cylinder and piston walls  
Vertical scratches → Replace cylinder and piston.
2. Measure:
  - Piston-to-cylinder clearance

#### Measurement steps:

##### 1st step:

- Measure the cylinder bore "C" with a cylinder bore gauge.

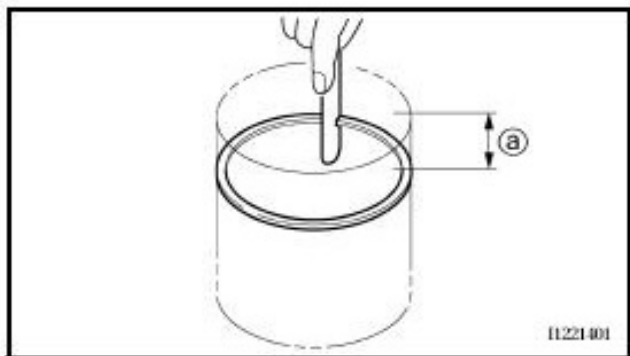
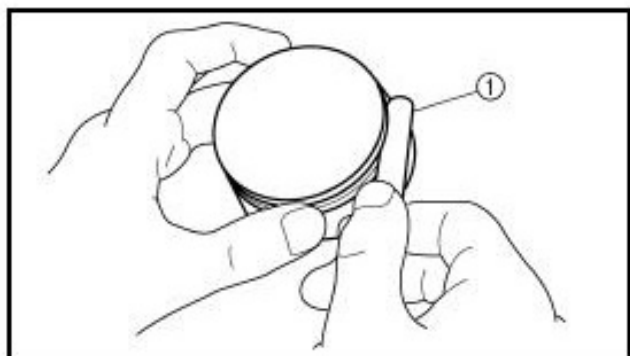
**NOTE:** \_\_\_\_\_  
Measure the cylinder bore "C" in parallel to and at right angles to the crankshaft. Then, find the average of the measurements.  
\_\_\_\_\_



Cylinder bore "C"	77.00 ~ 77.01 mm (3.0315 ~ 3.0319 in)
Taper limit "T"	0.05 mm (0.002 in)
Out of round "R"	0.05 mm (0.002 in)
<b>"C" = Maximum D</b>	
<b>"T" = (Maximum D<sub>1</sub> or D<sub>2</sub>) – (Maximum D<sub>5</sub> or D<sub>6</sub>)</b>	
<b>"R" = (Maximum D<sub>1</sub>, D<sub>3</sub> or D<sub>5</sub>) – (Minimum D<sub>2</sub>, D<sub>4</sub> or D<sub>6</sub>)</b>	
<ul style="list-style-type: none"> <li>If out of specification, replace the cylinder, and replace the piston and piston rings as set.</li> </ul>	
<b>2nd step:</b>	
<ul style="list-style-type: none"> <li>Measure the piston skirt diameter "P" with a micrometer.</li> </ul>	
Ⓐ 8 mm (0.31 in) from the piston bottom edge	
	<b>Piston size "P"</b>
<b>Standard</b>	76.955 ~ 76.970 mm (3.0297 ~ 3.0303 in)
<ul style="list-style-type: none"> <li>If out of specification, replace the piston and piston rings as a set.</li> </ul>	
<b>3rd step:</b>	
<ul style="list-style-type: none"> <li>Calculate the piston-to-cylinder clearance with following formula:</li> </ul>	
<b>Piston-to-cylinder clearance = Cylinder bore "C" – Piston skirt diameter "P"</b>	
	<b>Piston-to-cylinder clearance: 0.040 ~ 0.065 mm (0.0016 ~ 0.0026 in) &lt;Limit&gt;: 0.1 mm (0.004 in)</b>
<ul style="list-style-type: none"> <li>If out of specification, replace the cylinder, and replace the piston and piston rings as set.</li> </ul>	




6.2.2 Piston ring



1. Measure:
  - Ring side clearance
  - Use a feeler gauge ①.
  - Out of specification → Replace the piston and rings as a set.

**NOTE:** \_\_\_\_\_  
Clean carbon from the piston ring grooves and rings before measuring the side clearance.

	Side clearance:	
	Standard	<Limit>
Top ring	0.030 ~ 0.065 mm (0.0012 ~ 0.0026 in)	0.12 mm (0.005 in)
2nd ring	0.020 ~ 0.055 mm (0.0008 ~ 0.0022 in)	0.12 mm (0.005 in)


2. Position:
  - Piston ring  
(in cylinder)

**NOTE:** \_\_\_\_\_  
Insert a ring into the cylinder and push it approximately 10 mm (0.39 in) into the cylinder. Push the ring with the piston crown so that the ring will be at a right angle to the cylinder bore.

① 10 mm (0.39 in)

3. Measure:
  - Ring end gap
  - Out of specification → Replace.

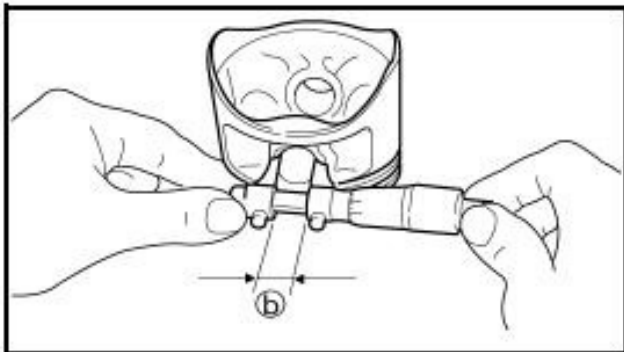
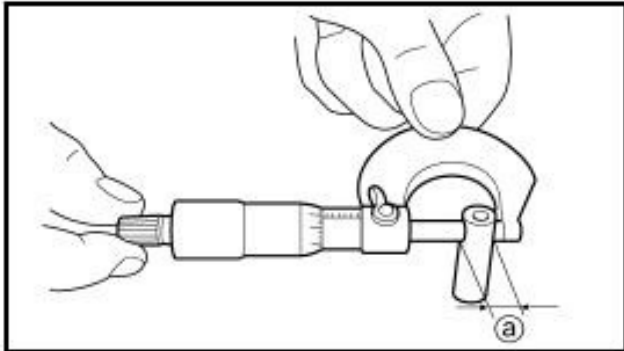
**NOTE:** \_\_\_\_\_  
You cannot measure the end gap on the expander spacer of the oil control ring. If the oil control ring rails show excessive gap, replace all three rings.




	End gap:	
	Standard	<Limit>
Top ring	0.15 ~ 0.25 mm (0.006 ~ 0.010 in)	0.50 mm (0.020 in)
2nd ring	0.30 ~ 0.45 mm (0.012 ~ 0.018 in)	0.80 mm (0.031 in)
Oil ring	0.10 ~ 0.40 mm (0.004 ~ 0.016 in)	—



6.3 Piston pin

1. Inspect:
  - Piston pin  
Blue discoloration/grooves → Replace, then inspect the lubrication system.
2. Measure:
  - Piston pin-to-piston clearance

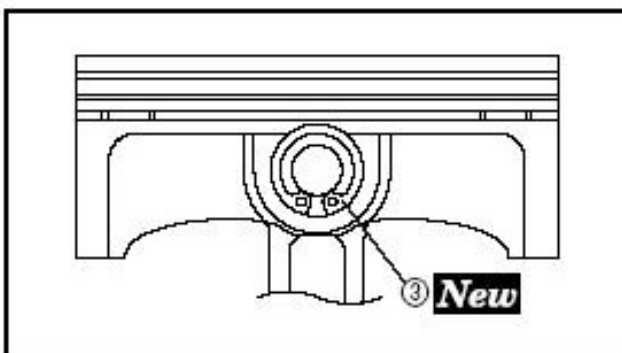
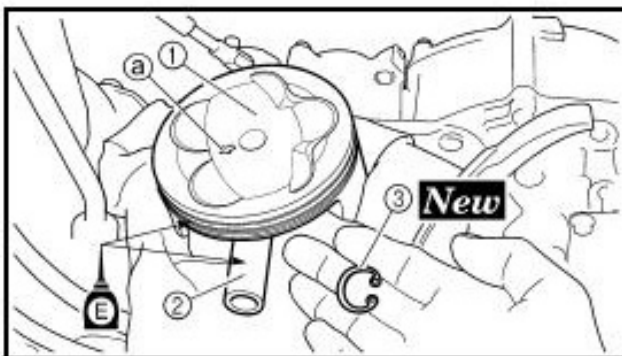
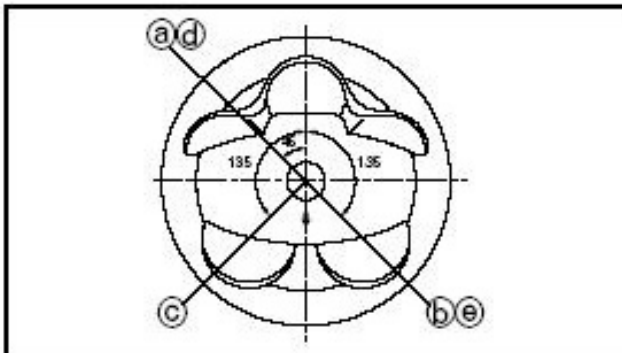
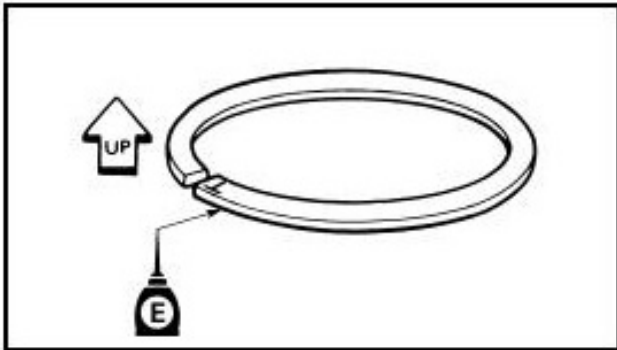


<b>Measurement steps:</b>	
<ul style="list-style-type: none"> <li>• Measure the outside diameter (piston pin) ①. If out of specification, replace the piston pin.</li> </ul>	
	<b>Outside diameter (piston pin):</b> 15.991 ~ 16.000 mm (0.6296 ~ 0.6299 in)
<ul style="list-style-type: none"> <li>• Measure the inside diameter (piston) ②.</li> </ul>	
	<b>Inside diameter (piston):</b> 16.002 ~ 16.013 mm (0.6300 ~ 0.6304 in)
<ul style="list-style-type: none"> <li>• Calculate the piston pin-to-piston clearance with the following formula.</li> </ul>	
<b>Piston pin-to-piston clearance =</b> Inside diameter (piston) ② – Outside diameter (piston pin) ①	
<ul style="list-style-type: none"> <li>• If out of specification, replace the piston.</li> </ul>	
	<b>Piston pin-to-piston clearance:</b> 0.002 ~ 0.022 mm (0.0001 ~ 0.0009 in) <Limit>: 0.07 mm (0.003 in)



## 6.4 Assembly and installation

### 6.4.1 Piston ring and piston



1. Install:
  - Piston ring
  - Onto the piston.

**NOTE:**

- Be sure to install the piston rings so that the manufacturer's marks or numbers are located on the upper side of the rings.
- Lubricate the piston and piston rings liberally with engine oil.

2. Position:
  - Top ring
  - 2nd ring
  - Oil ring

Offset the piston ring end gaps as shown.

- Ⓐ Top ring end
- Ⓑ 2nd ring end
- Ⓒ Oil ring end (upper)
- Ⓓ Oil ring
- Ⓔ Oil ring end (lower)

3. Install:
  - Piston ①
  - Piston pin ②
  - Piston pin clip ③ **New**

**NOTE:**

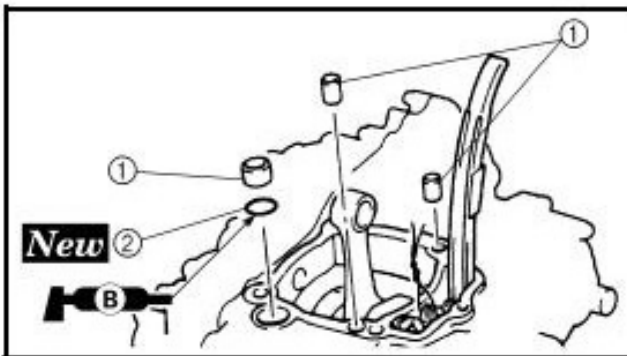
- Apply engine oil onto the piston pin and piston.
- Be sure that the arrow mark (a) on the piston points to the exhaust side of the engine.
- Before installing the piston pin clip, cover the crankcase with a clean rag to prevent the piston pin clip from falling into the crankcase.
- Install the piston pin clips with their ends facing downward.



## 6.5 Cylinder

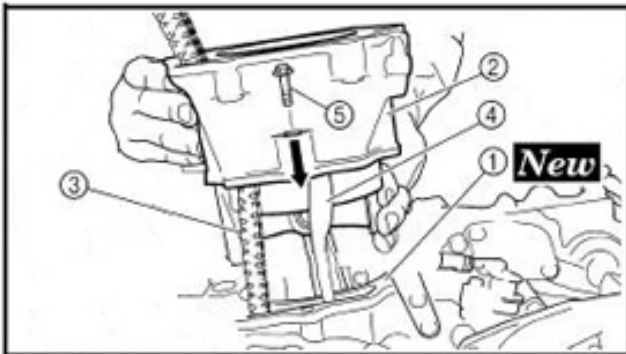
1. Lubricate:
  - Piston
  - Piston ring
  - Cylinder

**NOTE:** \_\_\_\_\_  
Apply a liberal coating of engine oil.



2. Install:
  - Dowel pin ①
  - O-ring ② **New**

**NOTE:** \_\_\_\_\_  
Apply the lithium soap base grease on the O-ring.



3. Install:
  - Cylinder gasket ① **New**
  - Cylinder ②

**NOTE:** \_\_\_\_\_  
Install the cylinder with one hand while compressing the piston rings with the other hand.

**CAUTION:** \_\_\_\_\_

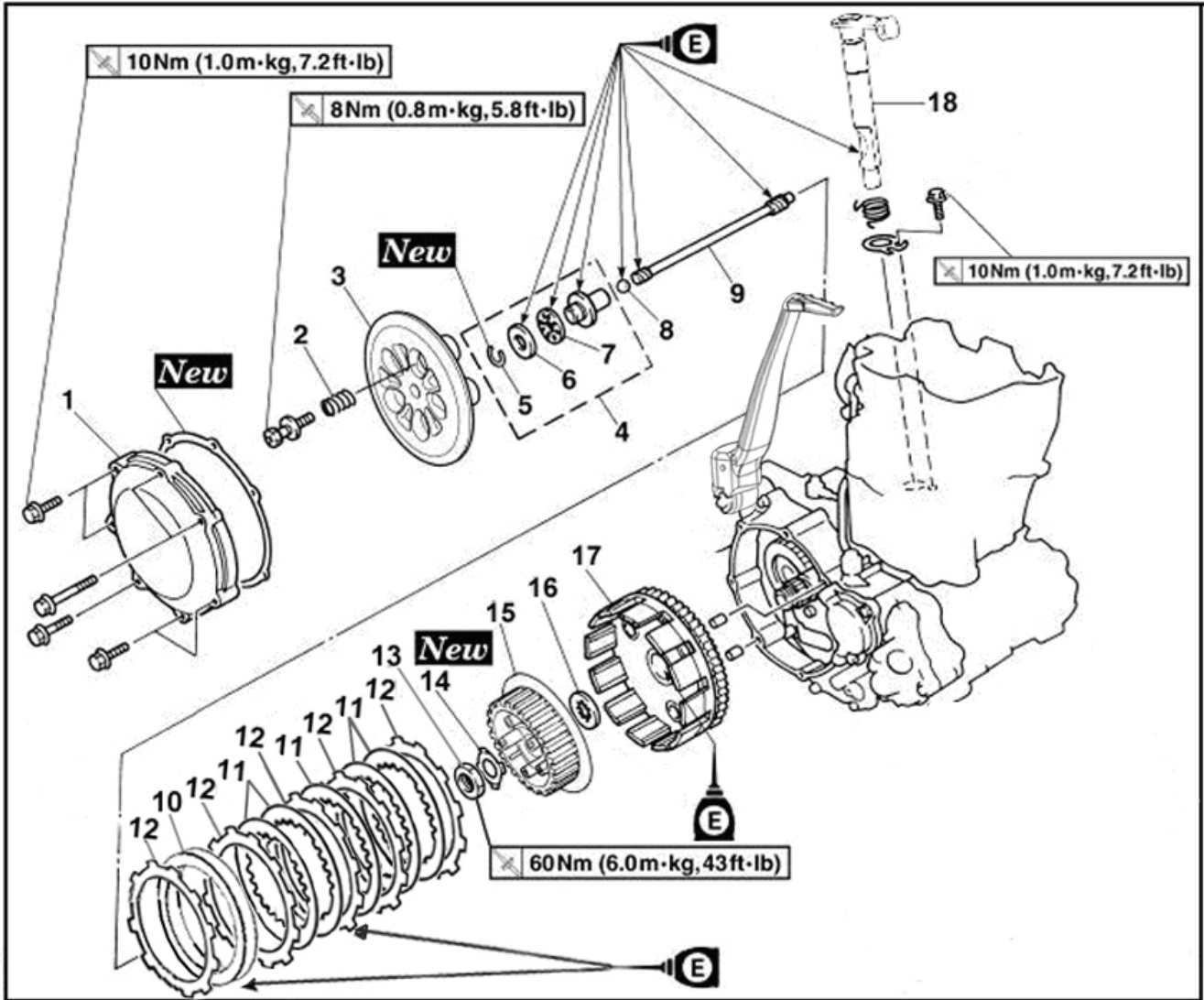
- Pass the timing chain ③ through the timing chain cavity.
- Be careful not to damage the timing chain guide ④ during installation.

4. Install:
  - Bolt (cylinder) ⑤

10 Nm (1.0 m · kg, 7.2 ft · lb)

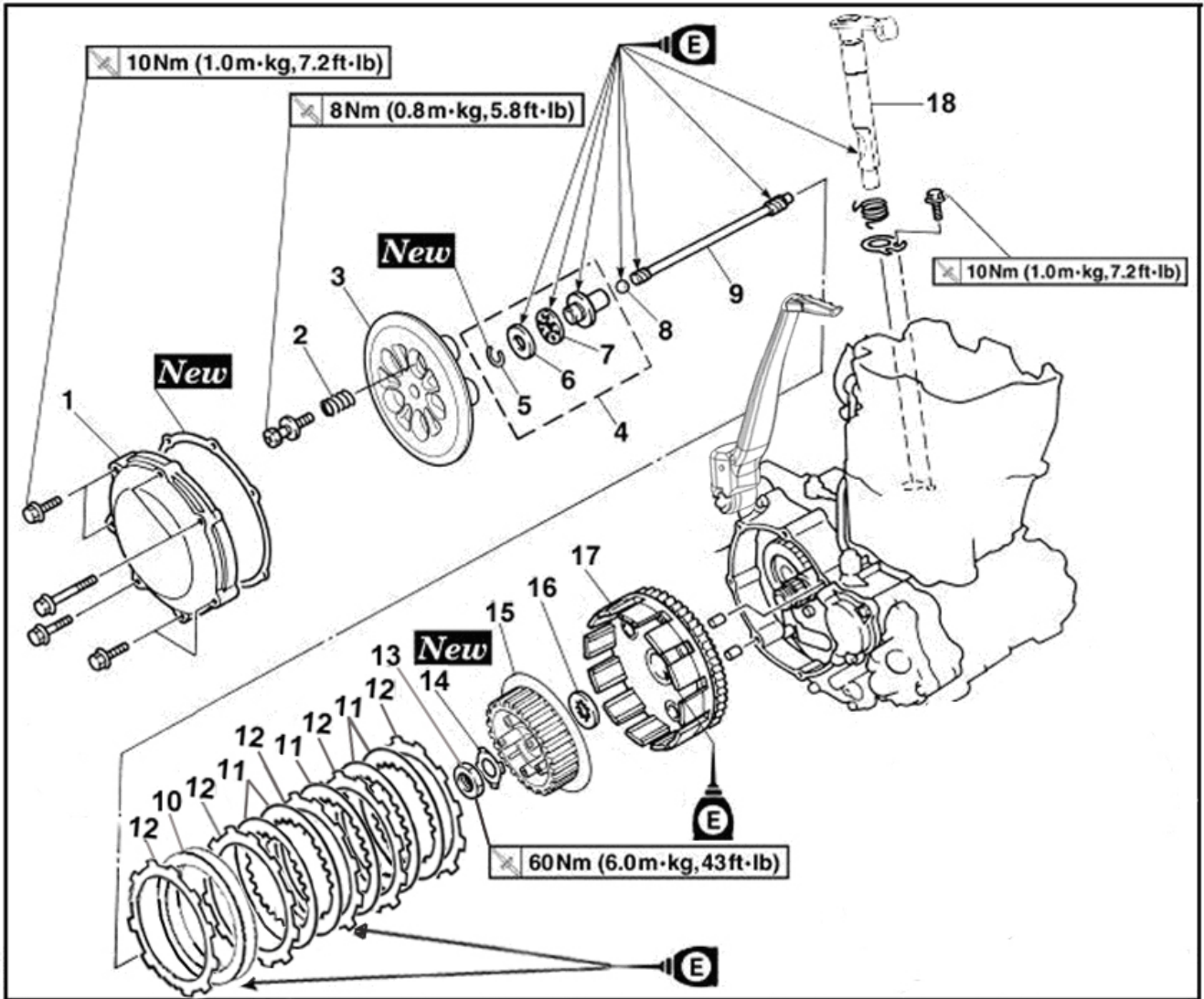


7 CLUTCH



Extent of removal: ① Push rod 1, 2 and push lever shaft removal      ② Push pod 1 disassembly  
 ③ Friction plate and clutch plate removal      ④ Primary driven gear removal

Extent of removal	Order	Part name	Q'ty	Remarks
Preparation for removal		<b>CLUTCH REMOVAL</b> Drain the engine oil.		Refer to "ENGINE OIL REPLACEMENT"
		Brake pedal Clutch cable		Refer to "ENGINE REMOVAL" section. Disconnect at engine side.
	1	Clutch cover	1	
	2	Clutch spring	5	
	3	Pressure plate	1	
	4	Push rod 1	1	
	5	Circlip	1	
	6	Washer	1	
	7	Bearing	1	
	8	Ball	1	
	9	Push rod 2	1	



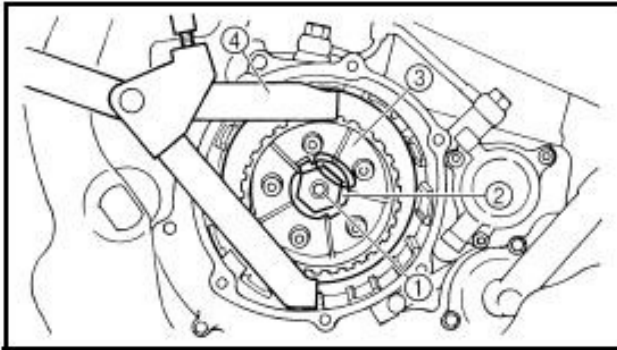
Extent of removal	Order	Part name	Q'ty	Remarks
③	10	Clutch shim	1	Use special tool. Refer to "REMOVAL POINTS".
	11	Clutch plate	5	
	12	Friction plate	5	
	13	Nut (clutch boss)	1	
	14	Lock washer	1	
	15	Clutch boss	1	
	16	Thrust washer	1	
	17	Primary driven gear	1	
①	18	Push lever shaft	1	





## 7.1 Removal points

### 7.1.1 Clutch boss



1. Remove:
  - Nut ①
  - Lock washer ②
  - Clutch boss ③

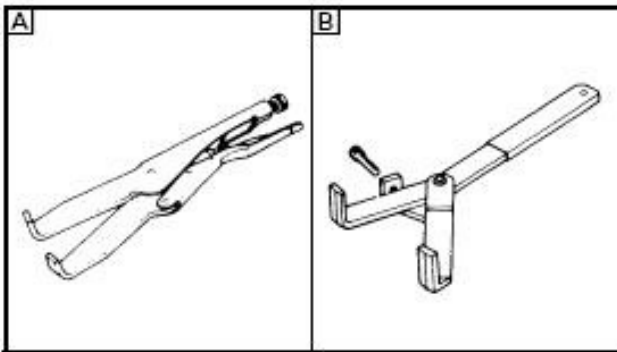
**NOTE:**

Straighten the lock washer tab and use the clutch holding tool ④ to hold the clutch boss.



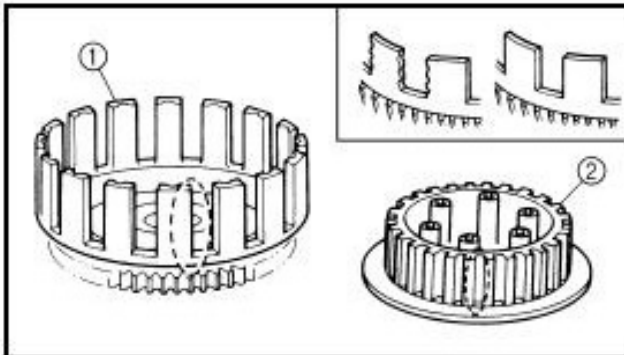
**Clutch holding tool:**  
YM-91042/90890-04086

- Ⓐ For USA and CDN
- Ⓑ Except for USA and CDN



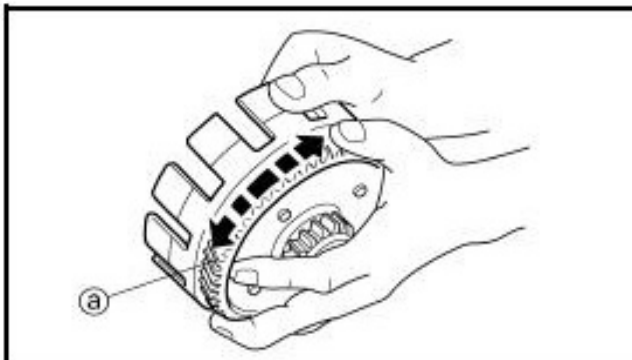
## 7.2 Inspection

### 7.2.1 Clutch housing and boss



1. Inspect:
  - Clutch housing ①  
Cracks/wear/damage → Replace.
  - Clutch boss ②  
Scoring/wear/damage → Replace.

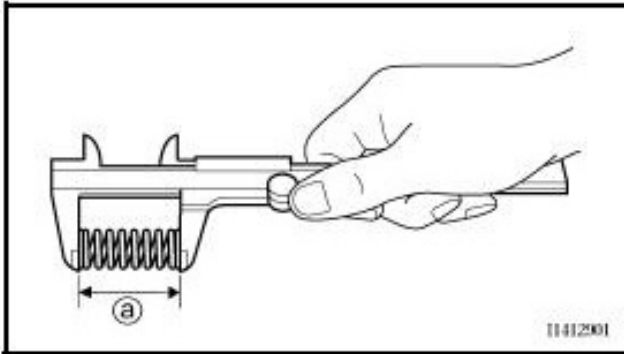
### 7.2.2 Primary driven gear



1. Check:
  - Circumferential play  
Free play exists → Replace.
  - Gear teeth ①  
Wear/damage → Replace.



### 7.2.3 Clutch spring

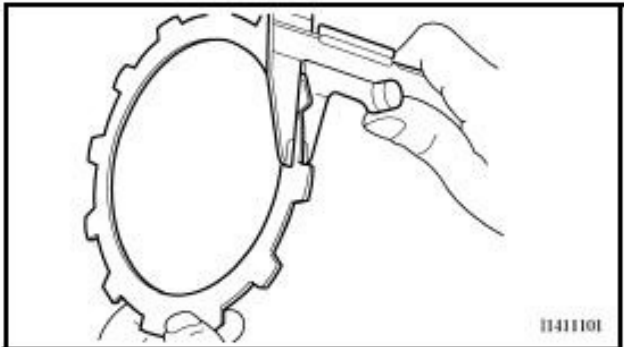


1. Measure:
  - Clutch spring free length ①
 Out of specification → Replace springs as a set.



**Clutch spring free length:**  
40.4 mm (1.59 in)  
<Limit>: 39.4 mm (1.55 in)

### 7.2.4 Friction plate

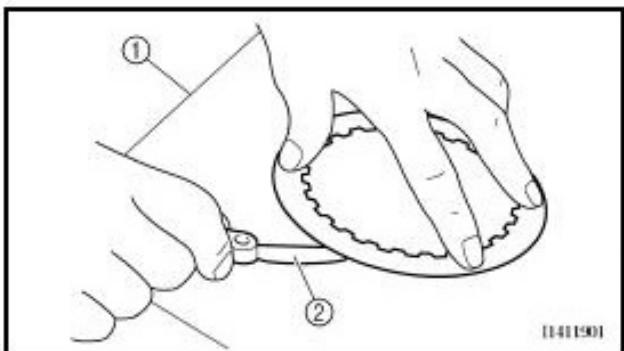


1. Measure:
  - Friction plate thickness
 Out of specification → Replace friction plate as a set.  
Measure at all four points.



**Friction plate thickness:**  
2.9 ~ 3.1 mm  
(0.114 ~ 0.122 in)  
<Limit>: 2.7 mm (0.106 in)

### 7.2.5 Clutch plate

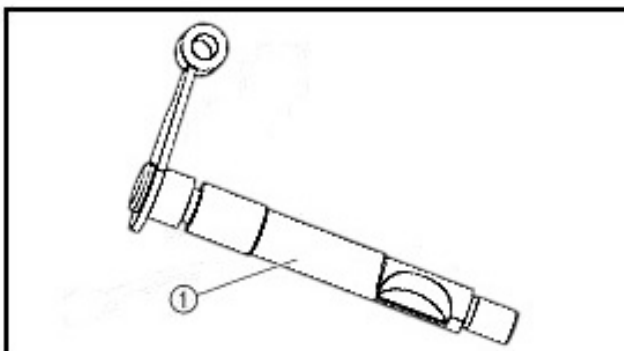


1. Measure:
  - Clutch plate warpage
 Out of specification → Replace clutch plate as a set.  
Use a surface plate ① and thickness gauge ②.



**Warp limit:**  
0.1 mm (0.004 in)

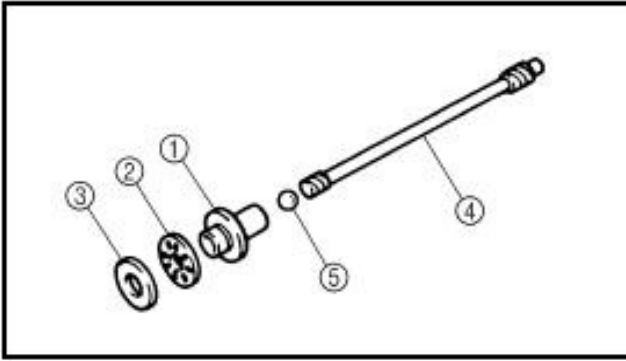
### 7.2.6 Push lever shaft



1. Inspect:
  - Push lever shaft ①
 Wear/damage → Replace.



### 7.2.7 Push rod



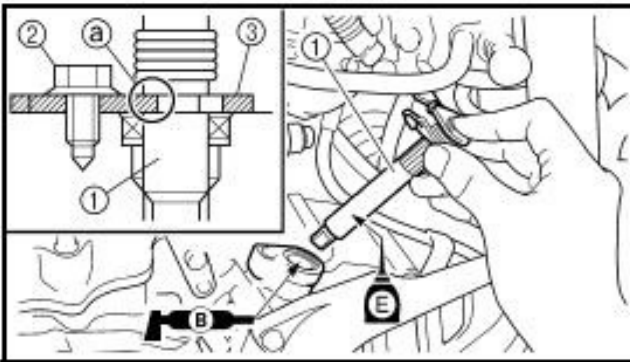
#### 1. Inspect:

- Push rod 1 ①
- Bearing ②
- Washer ③
- Push rod 2 ④
- Ball ⑤

Wear/damage/bend → Replace.


## 7.3 Assembly and installation

### 7.3.1 Push lever shaft



#### 1. Install:

- Push lever shaft ①
- Bolt (push lever shaft) ②

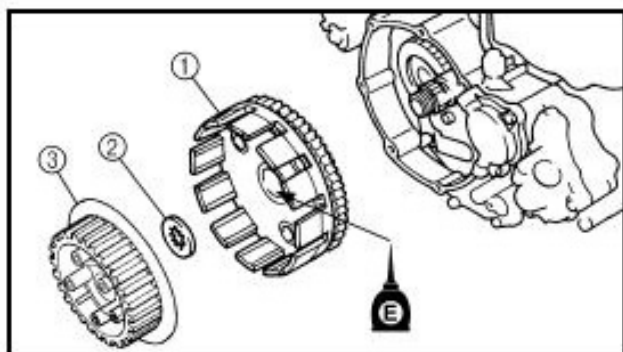
 10 Nm (1.0 m · kg, 7.2 ft · lb)

#### NOTE:

- Apply the lithium soap base grease on the oil seal lip.
- Apply the engine oil on the push lever shaft.
- Fit the seat plate ③ in the groove ② of the push lever shaft and tighten the bolt (seat plate).

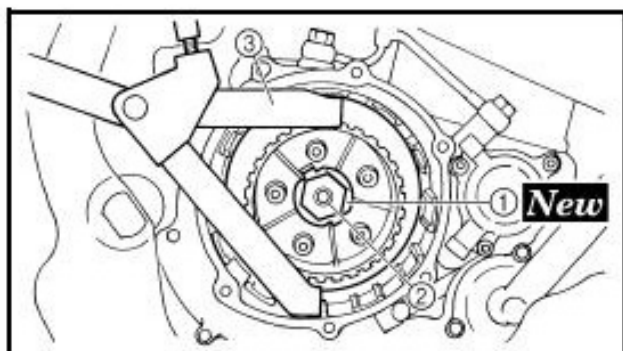


7.3.2 Clutch



1. Install:
  - Primary driven gear ①
  - Thrust washer ②
  - Clutch boss ③

**NOTE:** \_\_\_\_\_  
Apply the engine oil on the primary driven gear inner circumference.  
\_\_\_\_\_



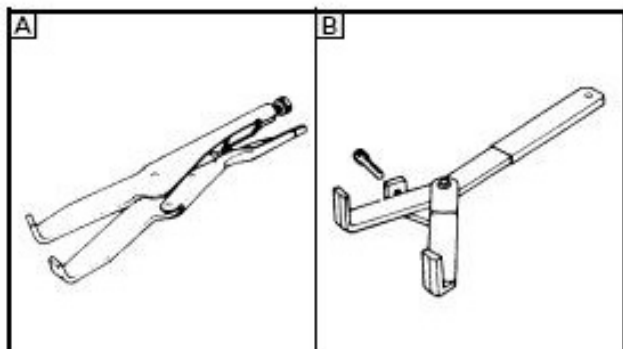
2. Install:
  - Lock washer ① **New**
  - Nut (clutch boss) ②

60 Nm (6.0 m · kg, 43 ft · lb)

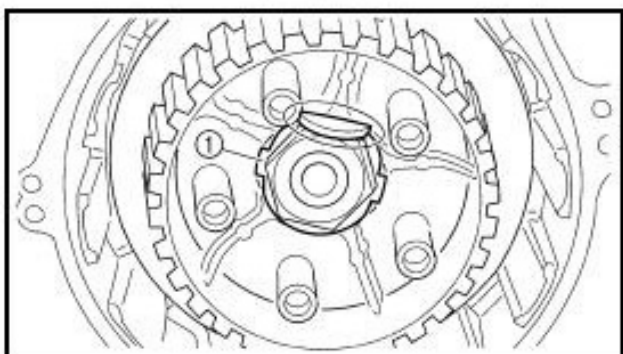
**NOTE:** \_\_\_\_\_  
Use the clutch holding tool ③ to hold the clutch boss.  
\_\_\_\_\_



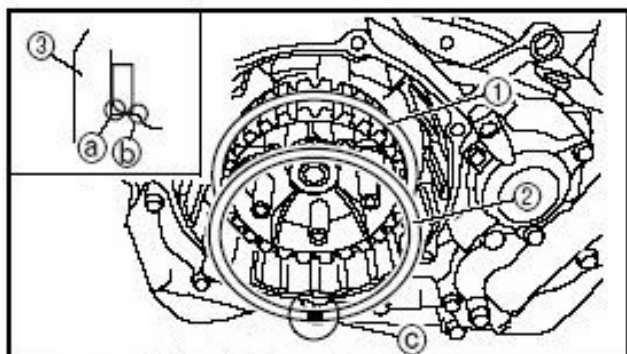
**Clutch holding tool:**  
YM-91042/90890-04086



- A** For USA and CDN
- B** Except for USA and CDN



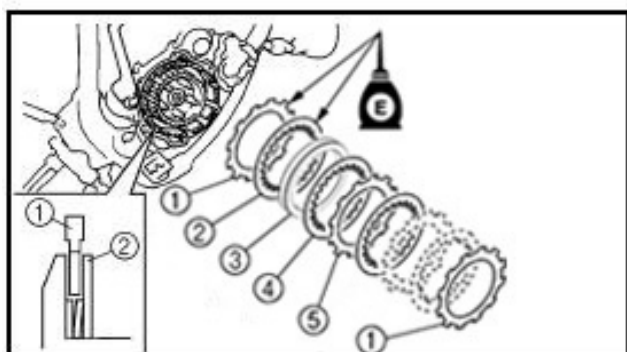
3. Bend the lock washer ① tab.



4. Install:
- Seat plate ①
  - Cushion spring ②

**NOTE:**

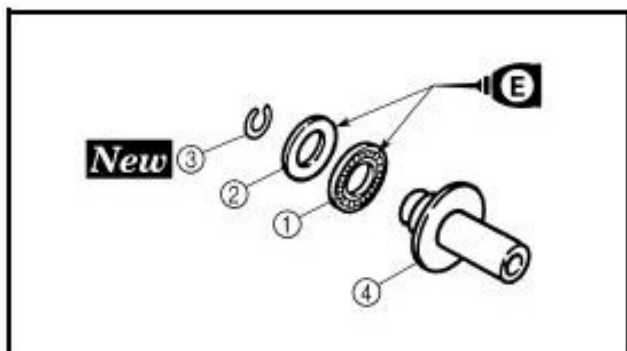
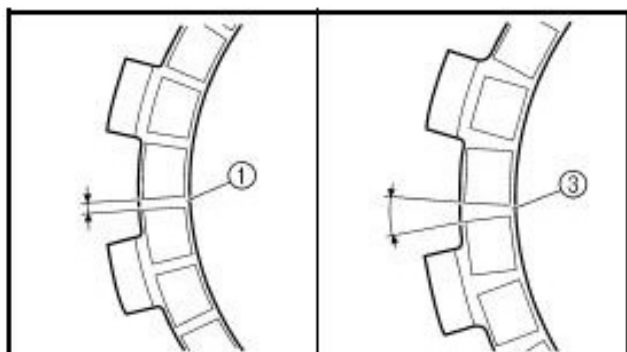
- Install the seat plate with its chamfered portion ① facing the clutch boss ③.
- Install the seat plate so that it is not caught on the step ②.
- Install the cushion spring with the paint ③ facing out.



5. Install:
- Friction plate 1 ①
  - Clutch plate 1 ②
  - Clutch shim ③
  - Clutch plate 2 ④
  - Friction plate 2 ⑤

**NOTE:**

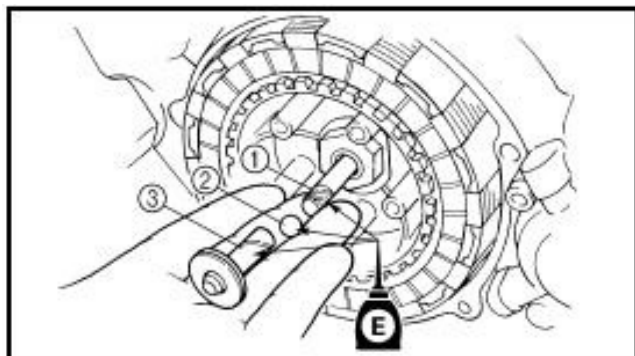
- Install the clutch plates and friction plates alternately on the clutch boss, starting with a friction plate and ending with a friction plate.
- Use the friction plates 1 for the first and final while paying attention to the difference in surface pattern.
- Apply the engine oil on the friction plates and clutch plates.
- Unlike the clutch plate 2, the clutch plate 1 has no surface gloss. Use the clutch plate 1 for the first while paying attention to the difference in surface gloss.



6. Install:
- Bearing ①
  - Washer ②
  - Circlip ③ **New**
  - To push rod 1 ④.

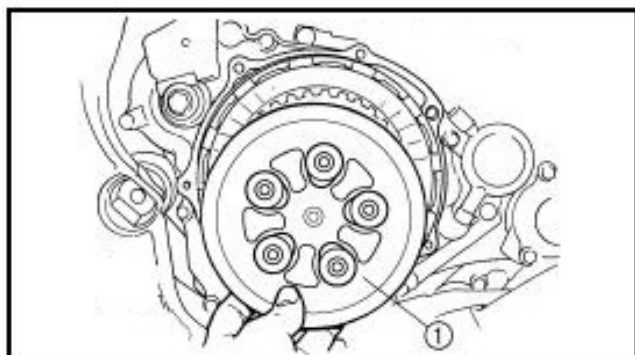
**NOTE:**

Apply the engine oil on the bearing and washer.

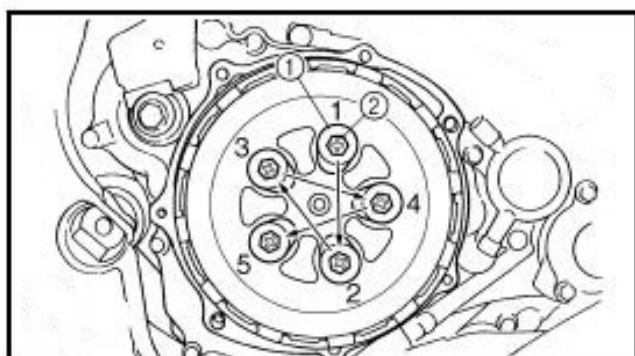


7. Install:
- Push rod 2 ①
  - Ball ②
  - Push rod 1 ③

**NOTE:** \_\_\_\_\_  
Apply the engine oil on the push rod 1, 2 and ball.



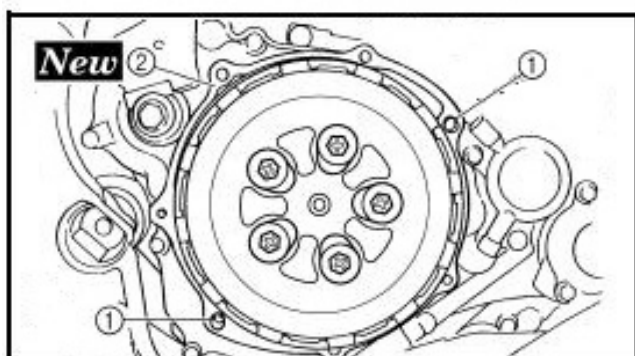
8. Install:
- Pressure plate ①



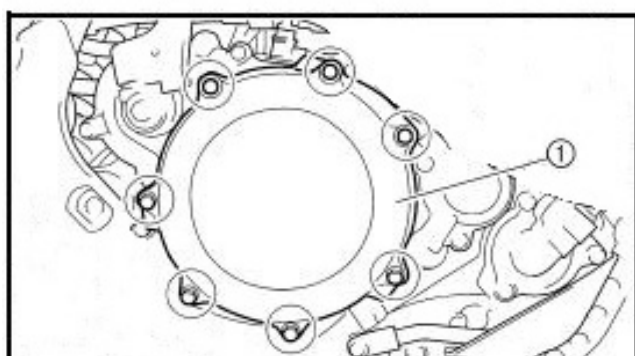
9. Install:
- Clutch spring ①
  - Bolt (clutch spring) ②

8 Nm (0.8 m · kg, 5.8 ft · lb)

**NOTE:** \_\_\_\_\_  
Tighten the bolts in stage, using a crisscross pattern.



10. Install:
- Dowel pin ①
  - Gasket (clutch cover) ② **New**



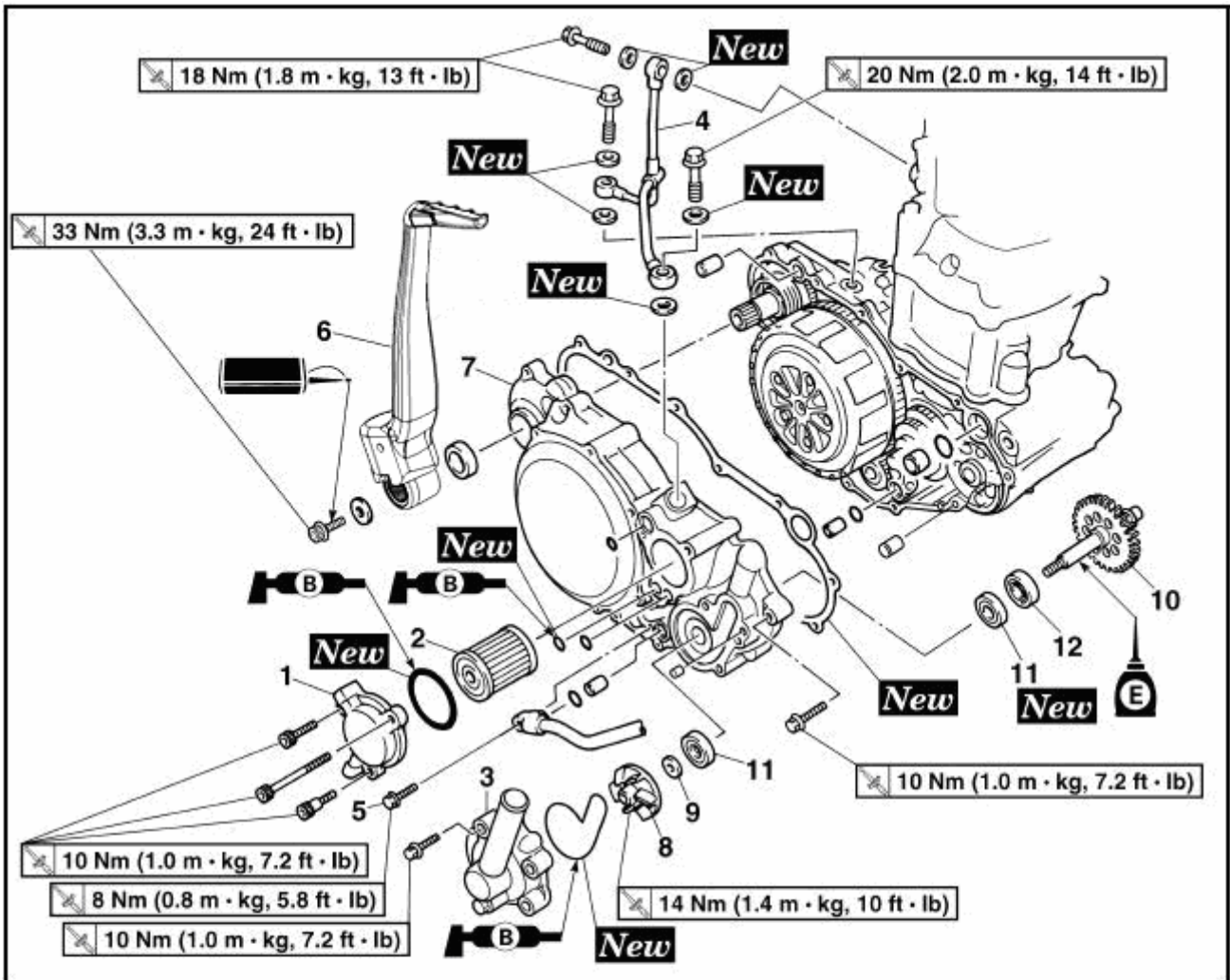
11. Install:
- Clutch cover ①
  - Bolt (clutch cover)

10 Nm (1.0 m · kg, 7.2 ft · lb)

**NOTE:** \_\_\_\_\_  
Tighten the bolts in stage, using a crisscross pattern.



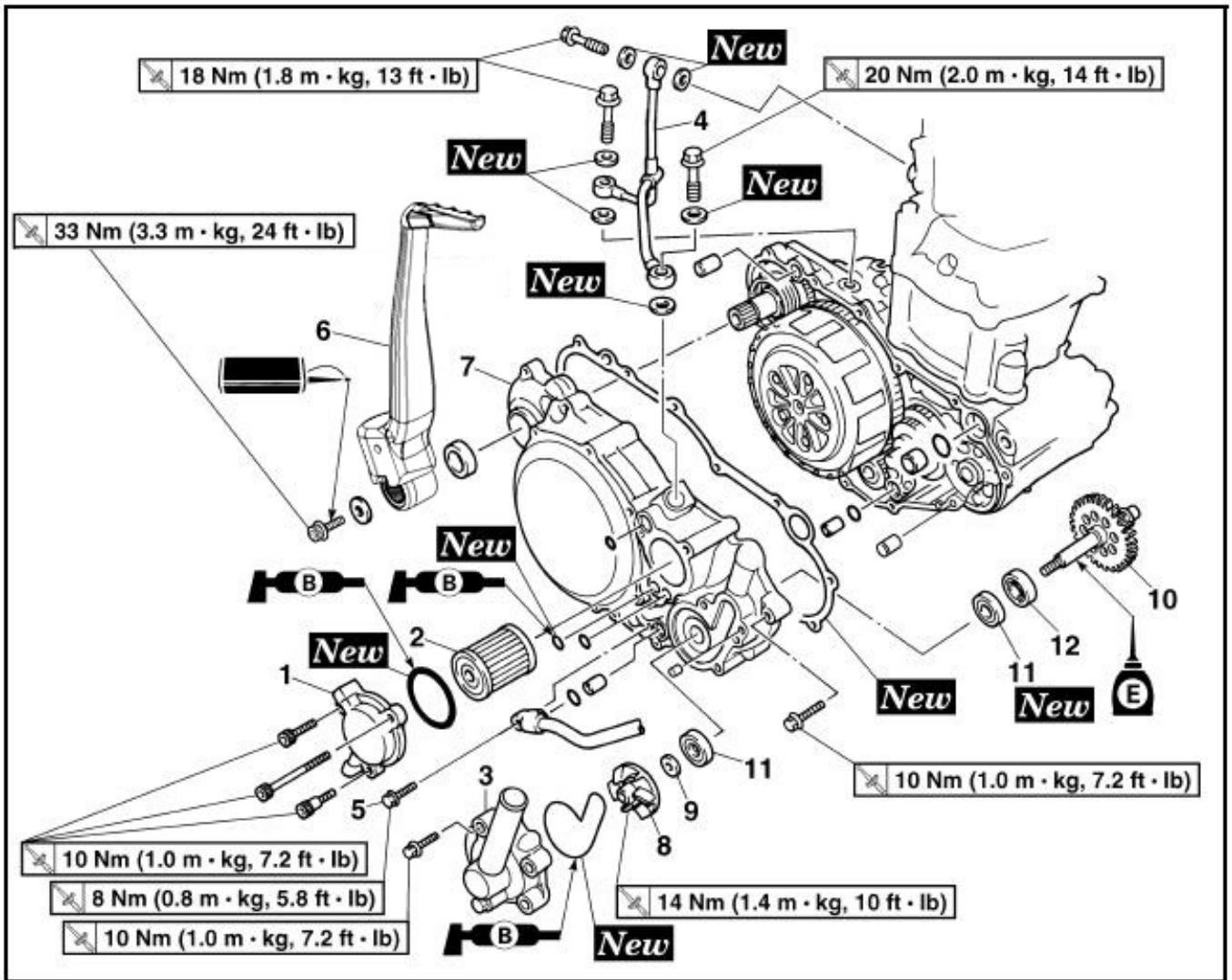
## 8 OIL FILTER ELEMENT, WATER PUMP AND RIGHT CRANKCASE COVER



Extent of removal:

- ① Oil filter element removal
- ② Water pump removal
- ③ Right crankcase cover removal

Extent of removal	Order	Part name	Q'ty	Remarks
Preparation for removal		<b>OIL FILTER ELEMENT, WATER PUMP AND RIGHT CRANKCASE COVER REMOVAL</b>		
		Drain the engine oil.		Refer to "ENGINE OIL REPLACEMENT"
		Drain the coolant.		Refer to "COOLANT REPLACEMENT"
		Radiator hose 3 Exhaust pipe		Disconnect at water pump side. Refer to "EXHAUST PIPE AND SILENCER" section.
		Brake pedal Right engine guard		Refer to "ENGINE REMOVAL" section.
①	1	Oil filter element cover	1	
③	2	Oil filter element	1	



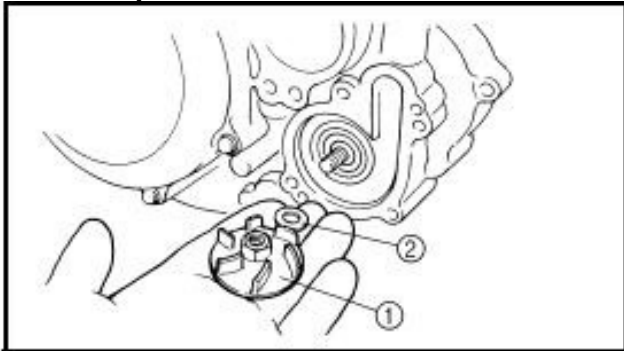
Extent of removal	Order	Part name	Q'ty	Remarks
	3	Water pump housing	1	Refer to "REMOVAL POINTS".
	4	Oil delivery pipe	1	
	5	Bolt (oil hose)	1	
	6	Kickstarter crank	1	
	7	Right crankcase cover	1	
	8	Impeller	1	
	9	Washer	1	
	10	Impeller shaft	1	
	11	Oil seal	2	
	12	Bearing	1	





## 8.1 Removal points

### 8.1.1 Impeller shaft

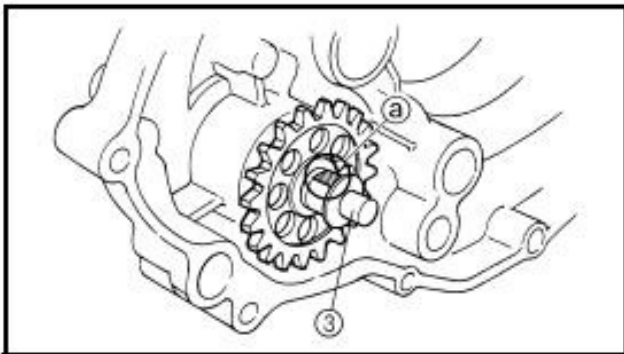


#### 1. Remove:

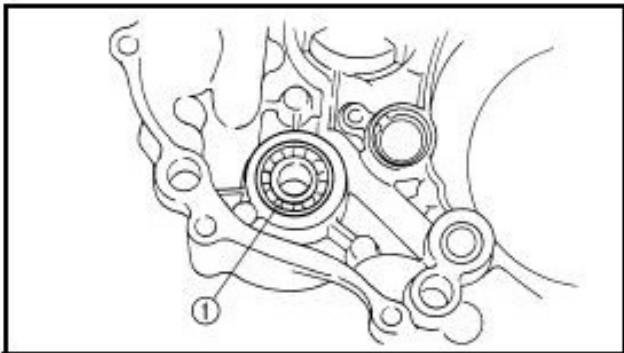
- Impeller ①
- Washer ②
- Impeller shaft ③

#### NOTE:

Hold the impeller shaft on its width across the flats ④ with spanners, etc. and remove the impeller.



### 8.1.2 Oil seal



#### NOTE:

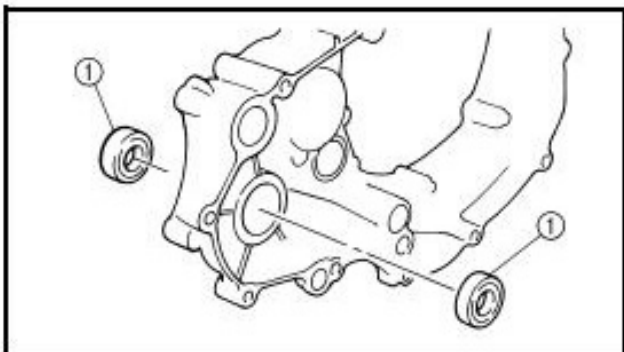
It is not necessary to disassemble the water pump, unless there is an abnormality such as excessive change in coolant level, discoloration of coolant, or milky transmission oil.

#### 1. Remove:

- Bearing ①

#### 2. Remove:

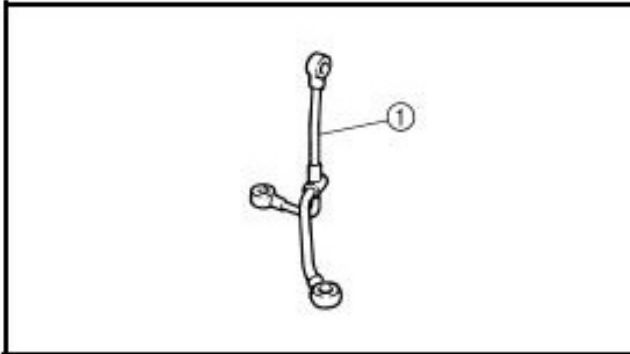
- Oil seal ①





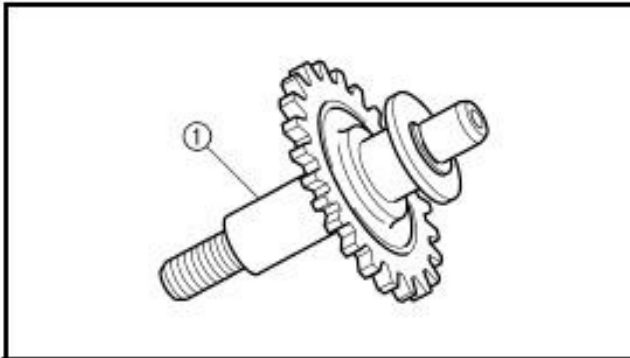
## 8.2 Inspection

### 8.2.1 Oil delivery pipe



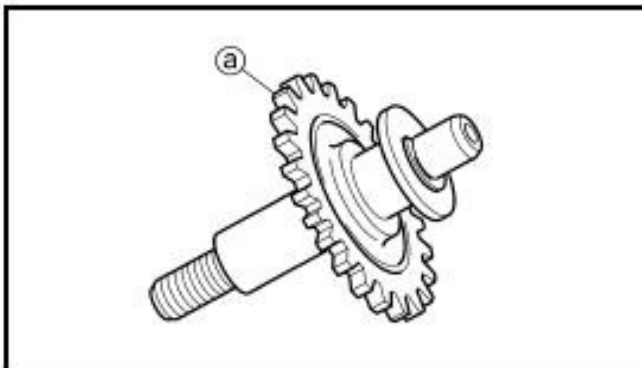
1. Inspect:
  - Oil delivery pipe ①  
Bend/damage → Replace.  
Clogged → Blow.

### 8.2.2 Impeller shaft



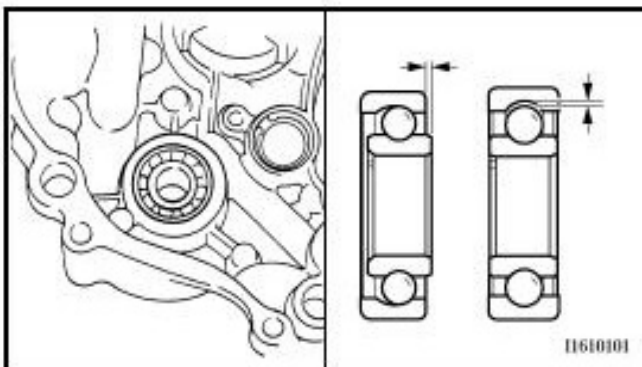
1. Inspect:
  - Impeller shaft ①  
Bend/wear/damage → Replace.  
Fur deposits → Clean.

### 8.2.3 Impeller shaft gear



1. Inspect:
  - Gear teeth ②  
Wear/damage → Replace.

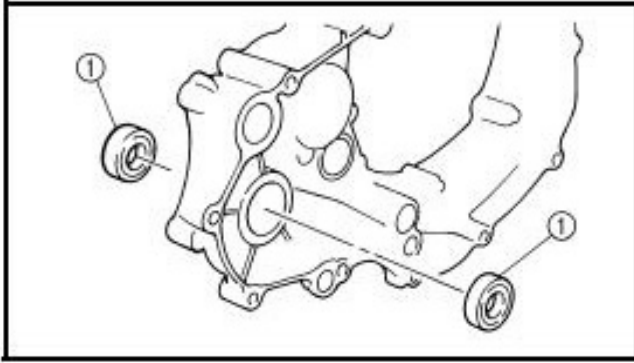
### 8.2.4 Bearing



1. Inspect:
  - Bearing  
Rotate inner race with a finger.  
Rough spot/seizure → Replace.



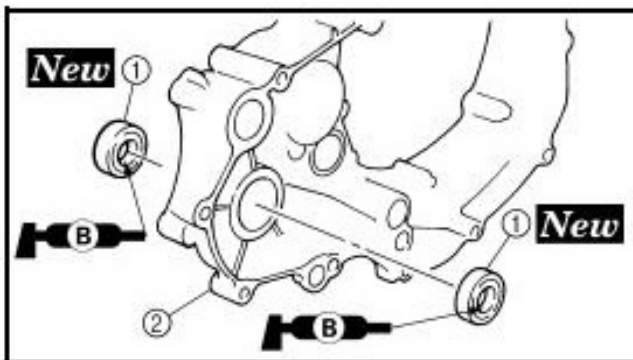
### 8.2.5 Oil seal



1. Inspect:
  - Oil seal ①
 Wear/damage → Replace.

## 8.3 Assembly and installation

### 8.3.1 Oil seal

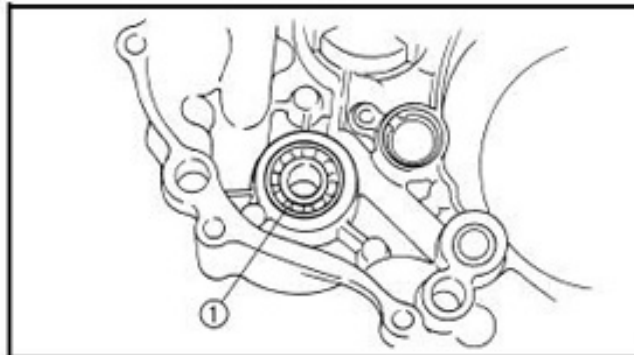


1. Install:
  - Oil seal ① **New**

**NOTE:** \_\_\_\_\_

- Apply the lithium soap base grease on the oil seal lip.
- Install the oil seal with its manufacture's marks or numbers facing the right crankcase cover ②.

---



2. Install:
  - Bearing ①

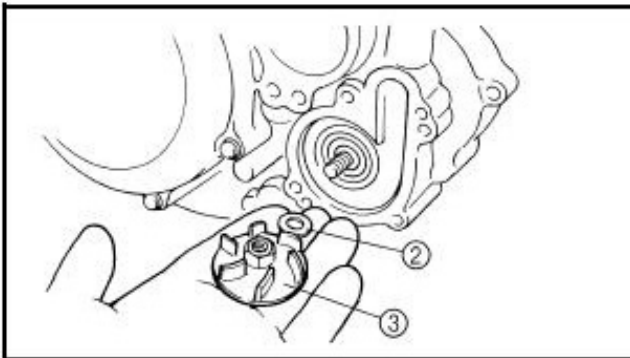
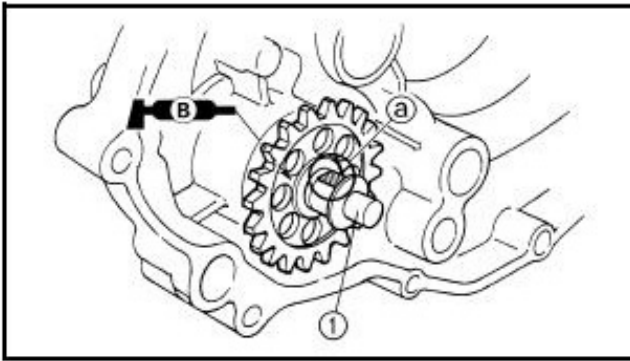
**NOTE:** \_\_\_\_\_

Install the bearing by pressing its outer race parallel.

---




### 8.3.2 Impeller shaft



#### 1. Install:

- Impeller shaft ①
- Washer ②
- Impeller ③

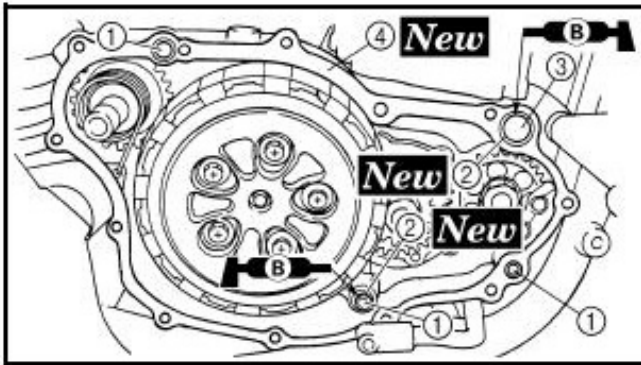
 14 Nm (1.4 m · kg, 10 ft · lb)

#### NOTE:

- Take care so that the oil seal lip is not damaged or the spring does not slip off its position.
- When installing the impeller shaft, apply the lithium soap base grease on the oil seal lip and impeller shaft. And install the shaft while turning it.
- Hold the impeller shaft on its width across the flats @ with spanners, etc. and install the impeller.



### 8.3.3 Right crankcase cover

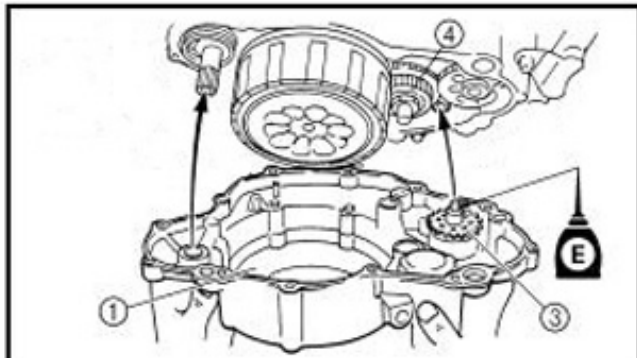


#### 1. Install:

- Dowel pin ①
- O-ring ② **New**
- Collar ③
- Gasket ④ **New**

#### NOTE:

Apply the lithium soap base grease on the O-ring.



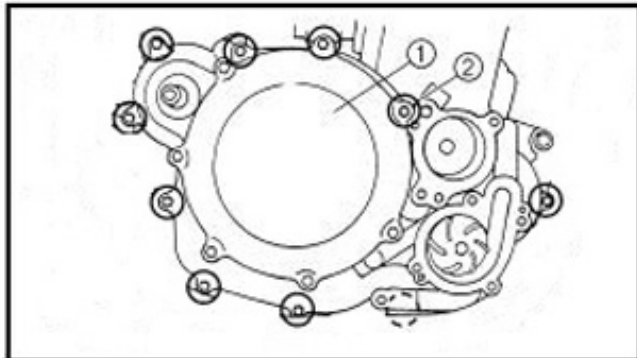
#### 2. Install:

- Right crankcase cover ①
- Bolt (right crankcase cover) ②

10 Nm (1.0 m · kg, 7.2 ft · lb)

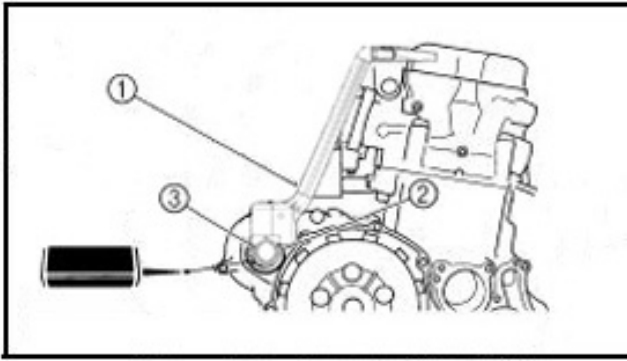
#### NOTE:

- Apply the engine oil on the impeller shaft end.
- Mesh the impeller shaft gear ③ with primary drive gear ④.
- Tighten the bolts in stage, using a crisscross pattern.






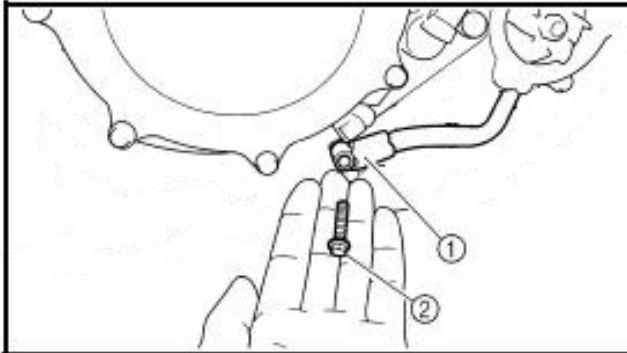
## 8.4 Kickstarter crank



### 1. Install:


- Kickstarter crank ①
- Washer ②
- Bolt (kickstarter crank) ③

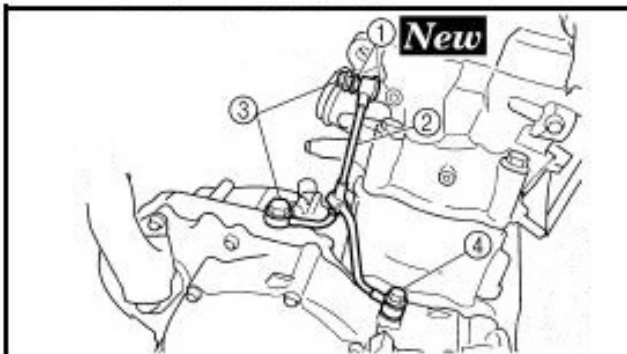
 **33 Nm (3.3 m · kg, 24 ft · lb)**



### 2. Install:


- Oil hose ①
- Bolt (oil hose) ②

 **8 Nm (0.8 m · kg, 5.8 ft · lb)**




### 3. Install:

- Copper washer ① **New**
- Oil delivery pipe ②
- Union bolt (M8) ③

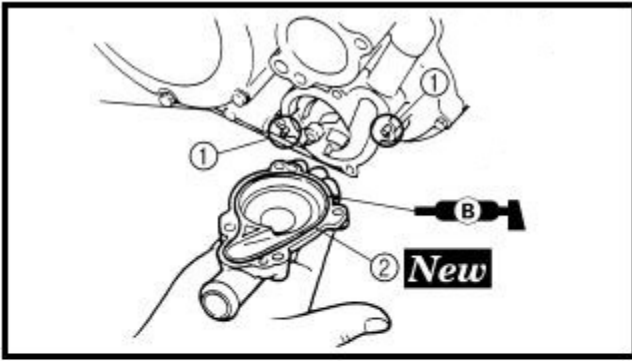
 **18 Nm (1.8 m · kg, 13 ft · lb)**

- Union bolt (M10) ④

 **20 Nm (2.0 m · kg, 14 ft · lb)**

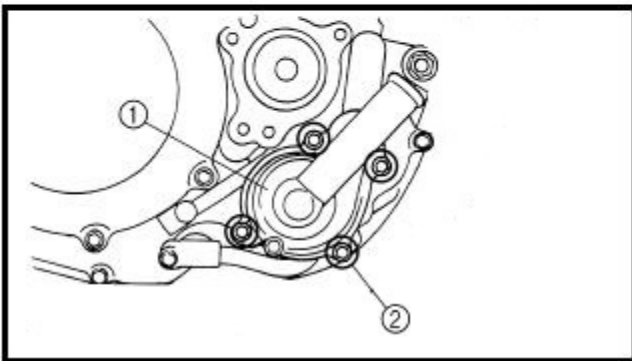


**8.4.1 Water pump housing**



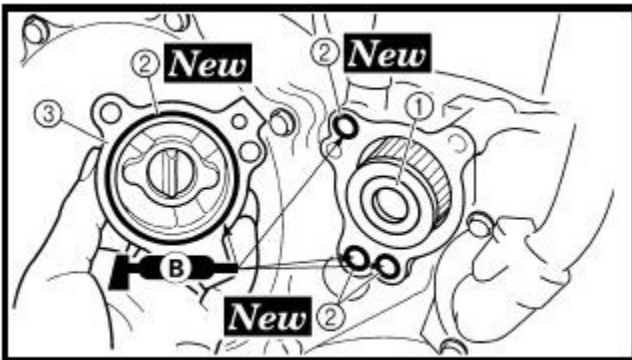
1. Install:
  - Dowel pin ①
  - O-ring ② **New**

**NOTE:** \_\_\_\_\_  
 Apply the lithium soap base grease on the O-ring.  
 \_\_\_\_\_



2. Install:
    - Water pump housing ①
    - Bolt (water pump housing) ②
- 10 Nm (1.0 m · kg, 7.2 ft · lb)**

**8.4.2 Oil filter element**



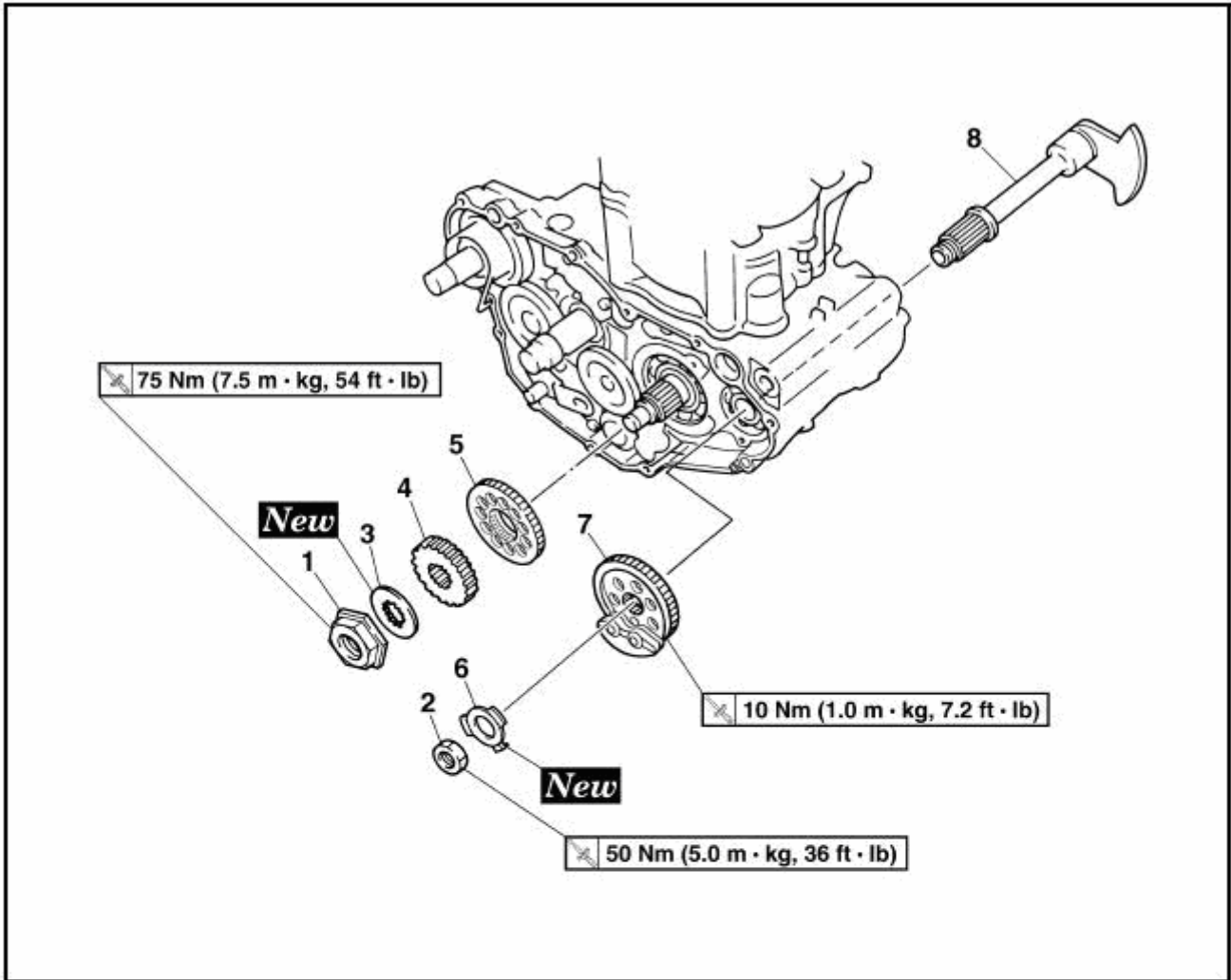
1. Install:
  - Oil filter element ①
  - O-ring ② **New**
  - Oil filter element cover ③
  - Bolt (oil filter element cover)

**10 Nm (1.0 m · kg, 7.2 ft · lb)**

**NOTE:** \_\_\_\_\_  
 Apply the lithium soap base grease on the O-ring.  
 \_\_\_\_\_



## 9 BALANCER



Extent of removal:                      ① Balancer shaft drive gear                      ② Balancer shaft

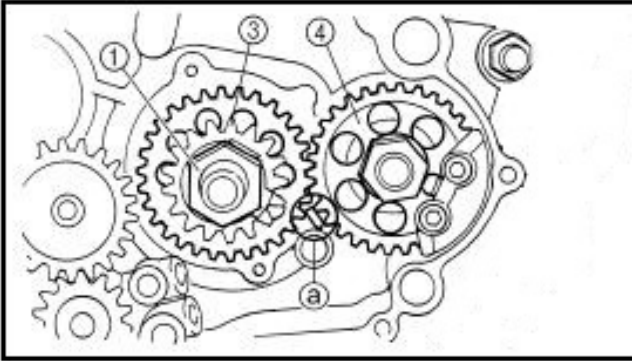
Extent of removal	Order	Part name	Q'ty	Remarks
Preparation for removal		<b>BALANCER REMOVAL</b>		
		Primary driven gear		Refer to "CLUTCH" section.
		Right crankcase cover		Refer to "OIL FILTER ELEMENT, WATER PUMP AND RIGHT CRANKCASE COVER" section.
		Stator		Refer to "AC MAGNETO" section.
	1	Nut (primary drive gear)	1	Refer to "REMOVAL POINTS".
	2	Nut (balancer shaft driven gear)	1	
	3	Lock washer	1	
	4	Primary drive gear	1	
	5	Balancer shaft drive gear	1	
	6	Lock washer	1	
	7	Balancer shaft driven gear	1	
	8	Balancer shaft	1	





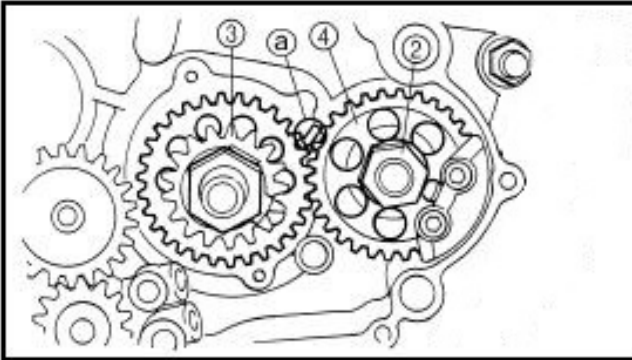
## 9.1 Removal points

### 9.1.1 Balancer shaft drive gear and balancer shaft driven gear

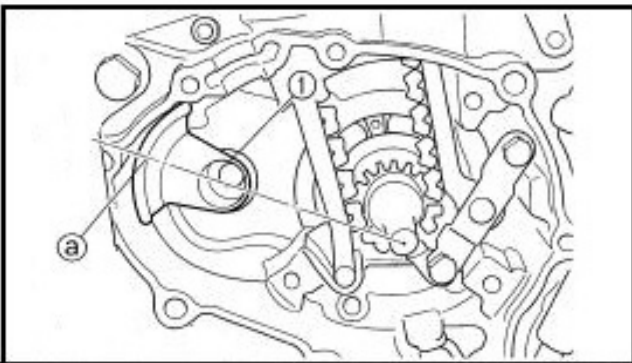


1. Straighten the lock washer tab.
2. Loosen:
  - Nut (primary drive gear) ①
  - Nut (balancer shaft driven gear) ②

**NOTE:** \_\_\_\_\_  
Place an aluminum plate (a) between the teeth of the balancer shaft drive gear ③ and driven gear ④.



### 9.1.2 Balancer

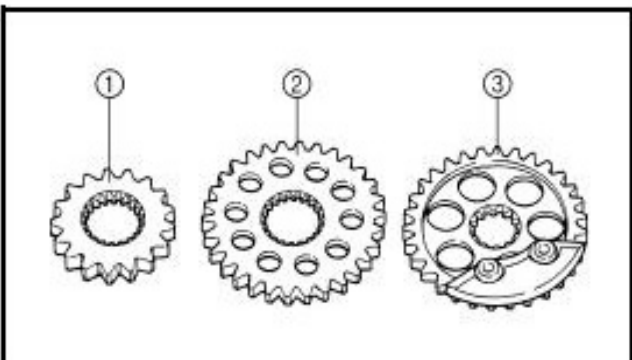


1. Remove:
  - Balancer shaft ①

**NOTE:** \_\_\_\_\_  
When removing the balancer shaft, align the center (a) of the balancer shaft weight along the line connecting the centers of the crankshaft and balancer shaft.

## 9.2 Inspection

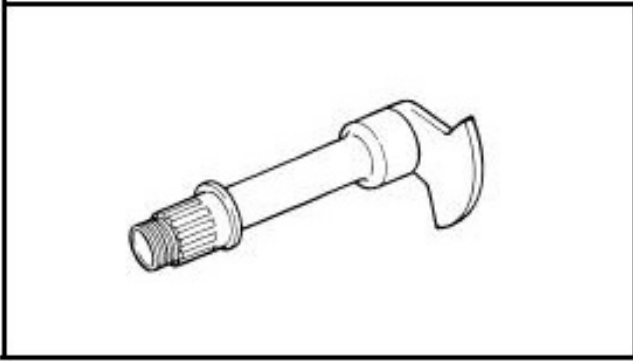
### 9.2.1 Primary drive gear, balancer shaft drive gear and balancer shaft driven gear



1. Inspect:
  - Primary drive gear ①
  - Balancer shaft drive gear ②
  - Balancer shaft driven gear ③
 Wear/damage → Replace.



### 9.2.2 Balancier

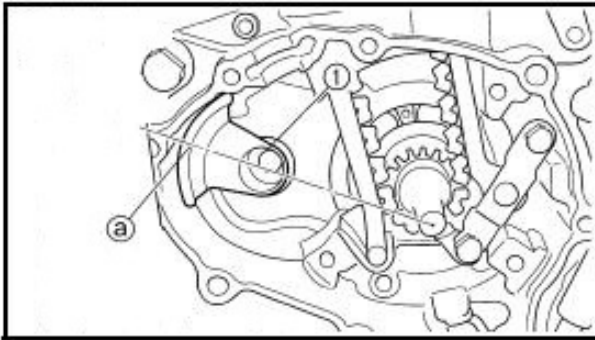


1. Inspect:
  - Balancer shaft  
Cracks/damage → Replace.



## 9.3 Assemblage et installation

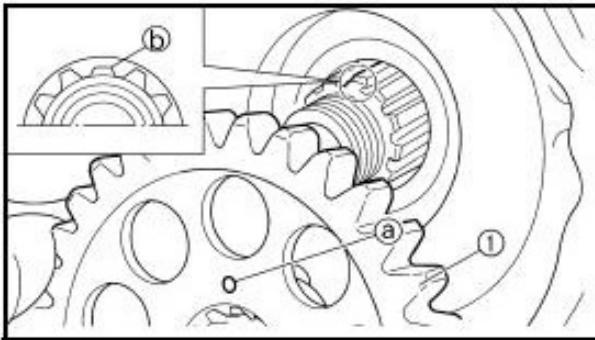
### 9.3.1 Balancer shaft drive gear and balancer shaft drive gear



1. Install:
  - Balancer shaft ①

**NOTE:**

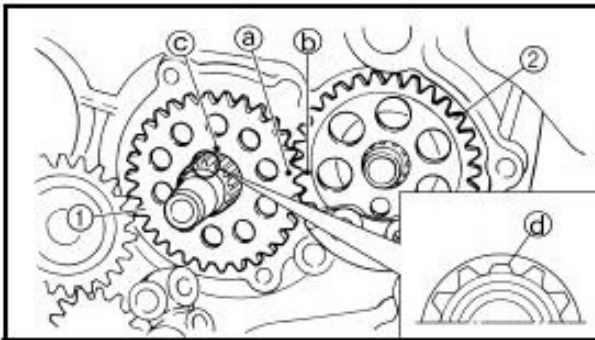
- Apply the engine oil on the bearing.
- When installing the balancer shaft, align the center (a) of the balancer shaft weight along the line connecting the centers of the crankshaft and balancer shaft.



2. Install:
  - Balancer shaft driven gear ①

**NOTE:**

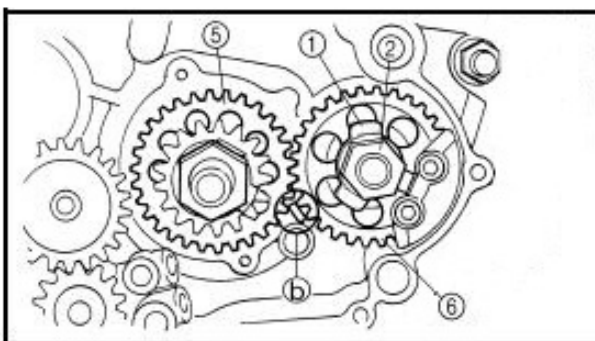
- Install the balancer shaft driven gear onto the balancer shaft while aligning the punch mark (a) on the balancer shaft driven gear with the lower spline (b) on the balancer shaft end.



3. Install:
  - Balancer shaft drive gear ①

**NOTE:**

- Align the punched mark (a) on the balancer shaft drive gear with the punched mark (b) on the balancer shaft driven gear (2).
- Align the punched mark (c) on the balancer shaft drive gear with the lower spline (d) on the crankshaft end.



4. Install:
  - Lock washer ①
  - Nut (balancer shaft driven gear) ②

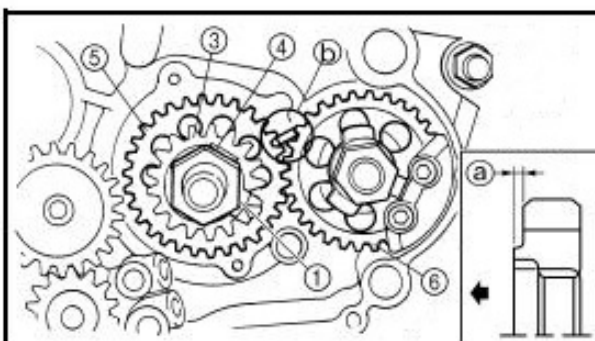
50 Nm (5.0 m · kg, 36 ft · lb)

- Primary drive gear ③
- Nut (primary drive gear) ④

75 Nm (7.5 m · kg, 54 ft · lb)

**NOTE:**

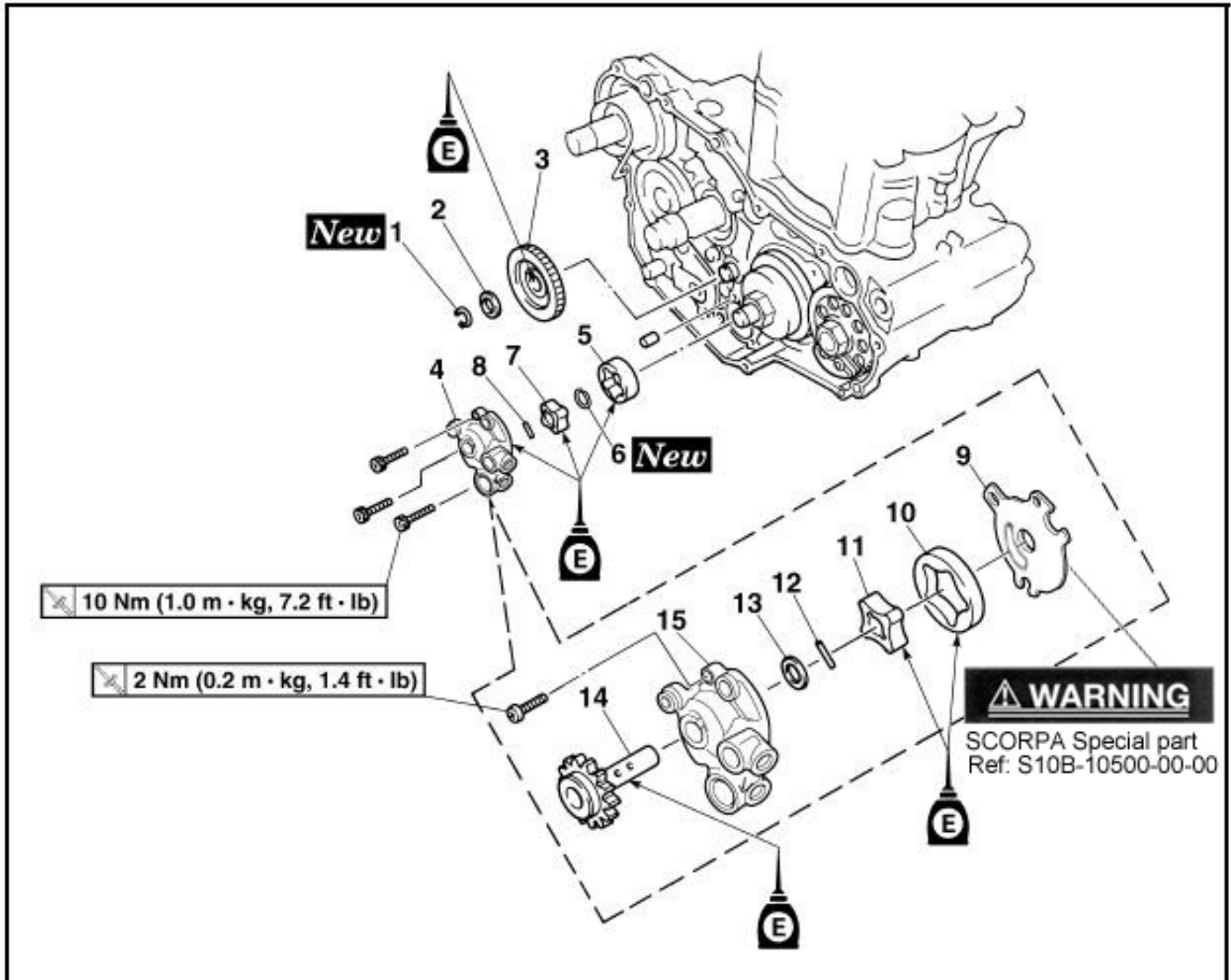
- Install the primary drive gear with its stepped side (a) facing the engine.
- Place an aluminum plate (b) between the teeth of the balancer shaft drive gear (5) and driven gear (6).



5. Bend the lock washer tab.



10 OIL PUMP

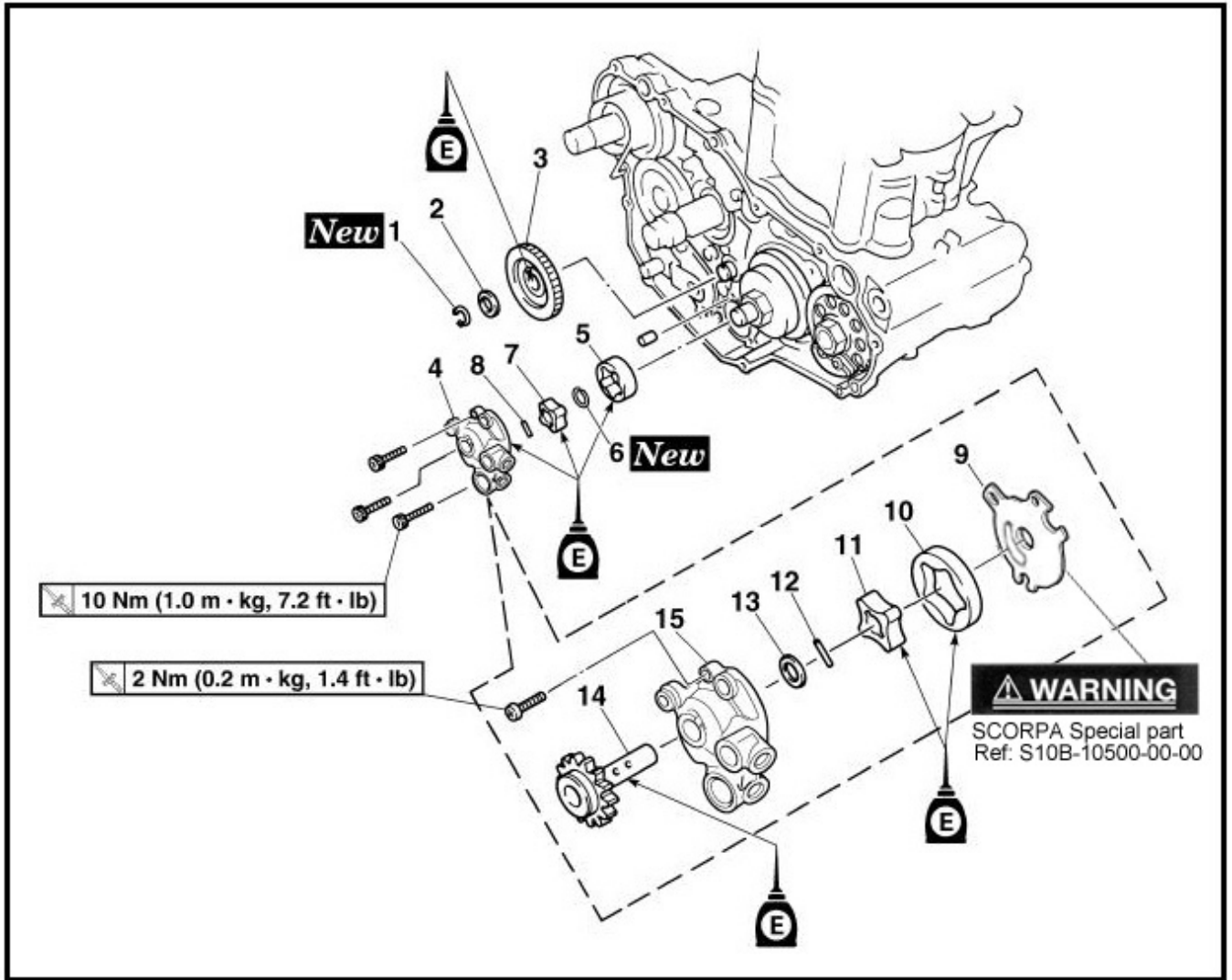


Extent of removal:

① Oil pump removal

② Oil pump disassembly

Extent of removal	Order	Part name	Q'ty	Remarks
Preparation for removal		<b>OIL PUMP REMOVAL AND DIS-ASSEMBLY</b> Primary driven gear Right crankcase cover		Refer to "CLUTCH" section. Refer to "OIL FILTER ELEMENT, WATER PUMP AND RIGHT CRANK-CASE COVER" section.
①	1	Circlip	1	
	2	Washer	1	
	3	Oil pump drive gear	1	
	4	Oil pump assembly	1	
	5	Outer rotor 2	1	
	6	Circlip	1	
	7	Inner rotor 2	1	
	8	Dowel pin	1	
	9	Oil pump cover	1	
	10	Outer rotor 1	1	
	11	Inner rotor 1	1	

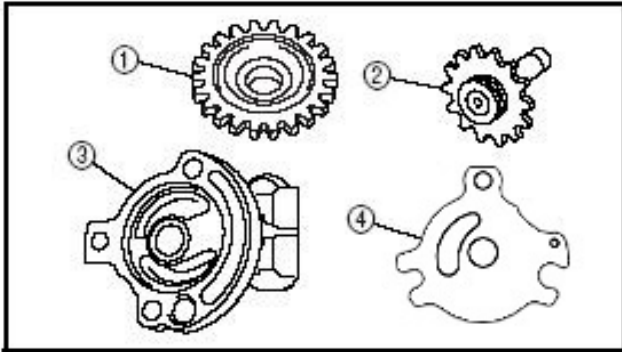


Extent of removal	Order	Part name	Q'ty	Remarks
	12	Dowel pin	1	
	13	Washer	1	
	14	Oil pump drive shaft	1	
	15	Rotor housing	1	



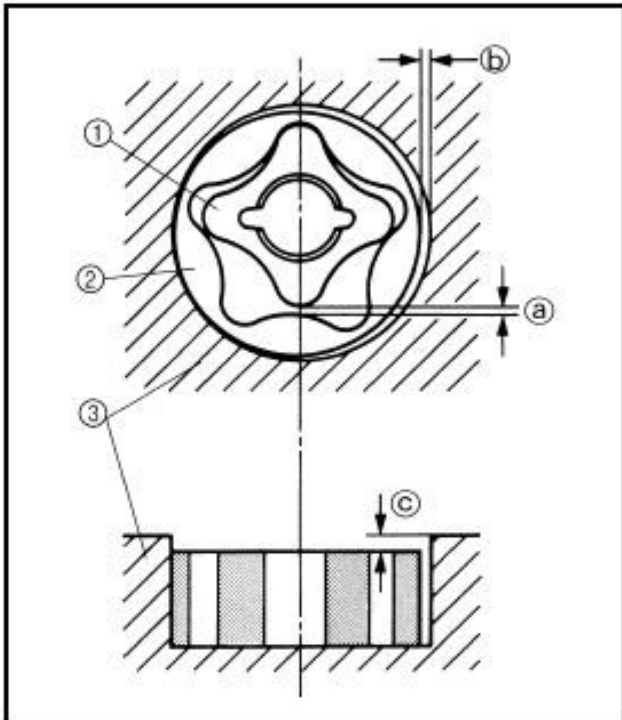
## 10.1 Inspection

### 10.1.1 Oil pump



1. Inspect:
  - Oil pump drive gear ①
  - Oil pump drive shaft ②
  - Rotor housing ③
  - Oil pump cover ④

**⚠ WARNING** SCORPA Special part  
 Ref: S10B-10500-00-00  
 Cracks/wear/damage → Replace.



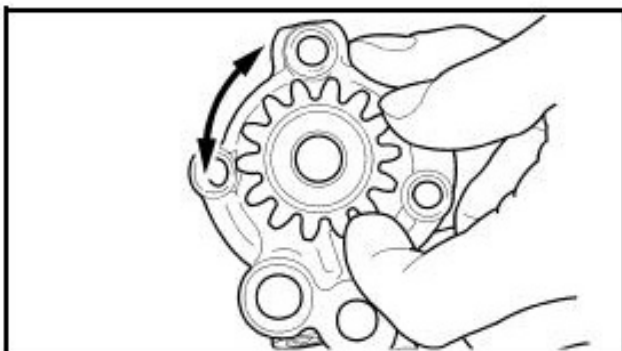
2. Measure:
  - Tip clearance ①  
 (between the inner rotor ① and outer rotor ②)
  - Side clearance ②  
 (between the outer rotor ② and rotor housing ③)
  - Housing and rotor clearance ③  
 (between the rotor housing ③ and rotors ① ②)
 Out of specification → Replace the oil pump assembly.



**Tip clearance ①:**  
 0.12 mm or less  
 (0.0047 in or less)  
 <Limit>: 0.20 mm (0.008 in)

**Side clearance ②:**  
 0.09 ~ 0.17 mm  
 (0.0035 ~ 0.0067 in)  
 <Limit>: 0.24 mm (0.009 in)

**Housing and rotor clearance ③:**  
 0.03 ~ 0.10 mm  
 (0.0012 ~ 0.0039 in)  
 <Limit>: 0.17 mm (0.0067 in)

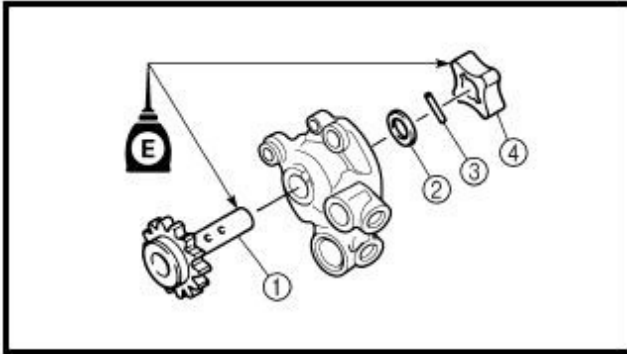


3. Check:
  - Unsmooth → Repeat steps #1 and #2 or replace the defective parts.



## 10.2 Assembly and installation

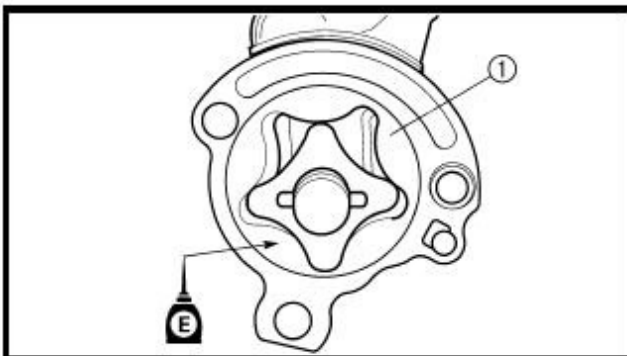
### 10.2.1 oil pump



1. Install:
  - Oil pump drive shaft ①
  - Washer ②
  - Dowel pin ③
  - Inner rotor 1 ④

**NOTE:** \_\_\_\_\_

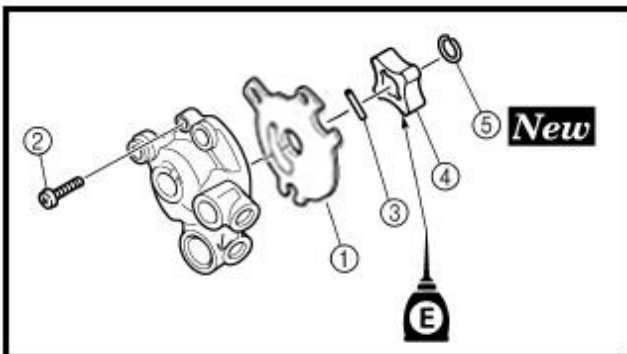
- Apply the engine oil on the oil pump drive shaft and inner rotor 1.
- Fit the dowel pin into the groove in the inner rotor 1.



2. Install:
  - Outer rotor 1 ①

**NOTE:** \_\_\_\_\_

- Apply the engine oil on the outer rotor 1.



3. Install:
  - Oil pump cover ①

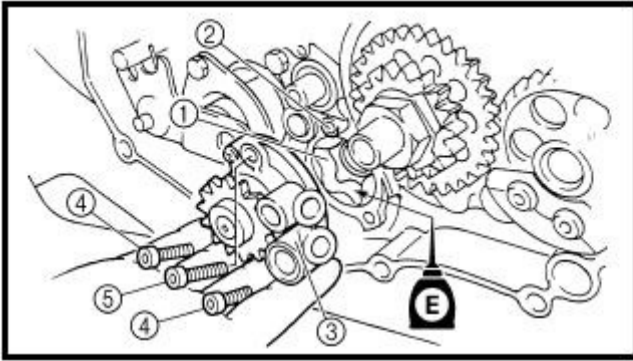
**WARNING** SCORPA Special part  
Ref. S10B-10500-00-00

- Screw (oil pump cover) ②  

2 Nm (0.2 m · kg, 1.4 ft · lb)
--------------------------------
- Dowel pin ③
- Inner rotor 2 ④
- Circlip ⑤ **New**

**NOTE:** \_\_\_\_\_

- Apply the engine oil on the inner rotor 2.
- Fit the dowel pin into the groove in the inner rotor 2.



4. Install:

- Outer rotor 2 ①
- Dowel pin ②
- Oil pump assembly ③
- Bolt (oil pump assembly)  
[L = 25 mm (0.94 in)] ④

10 Nm (1.0 m · kg, 7.2 ft · lb)

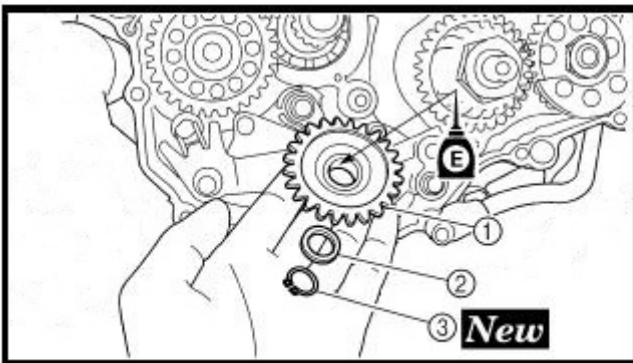
- Bolt (oil pump assembly)  
[L = 30 mm (1.18 in)] ⑤

10 Nm (1.0 m · kg, 7.2 ft · lb)

**NOTE:** \_\_\_\_\_

Apply the engine oil on the outer rotor 2.

---



5. Install:

- Oil pump drive gear ①
- Washer ②
- Circlip ③ **New**

**NOTE:** \_\_\_\_\_

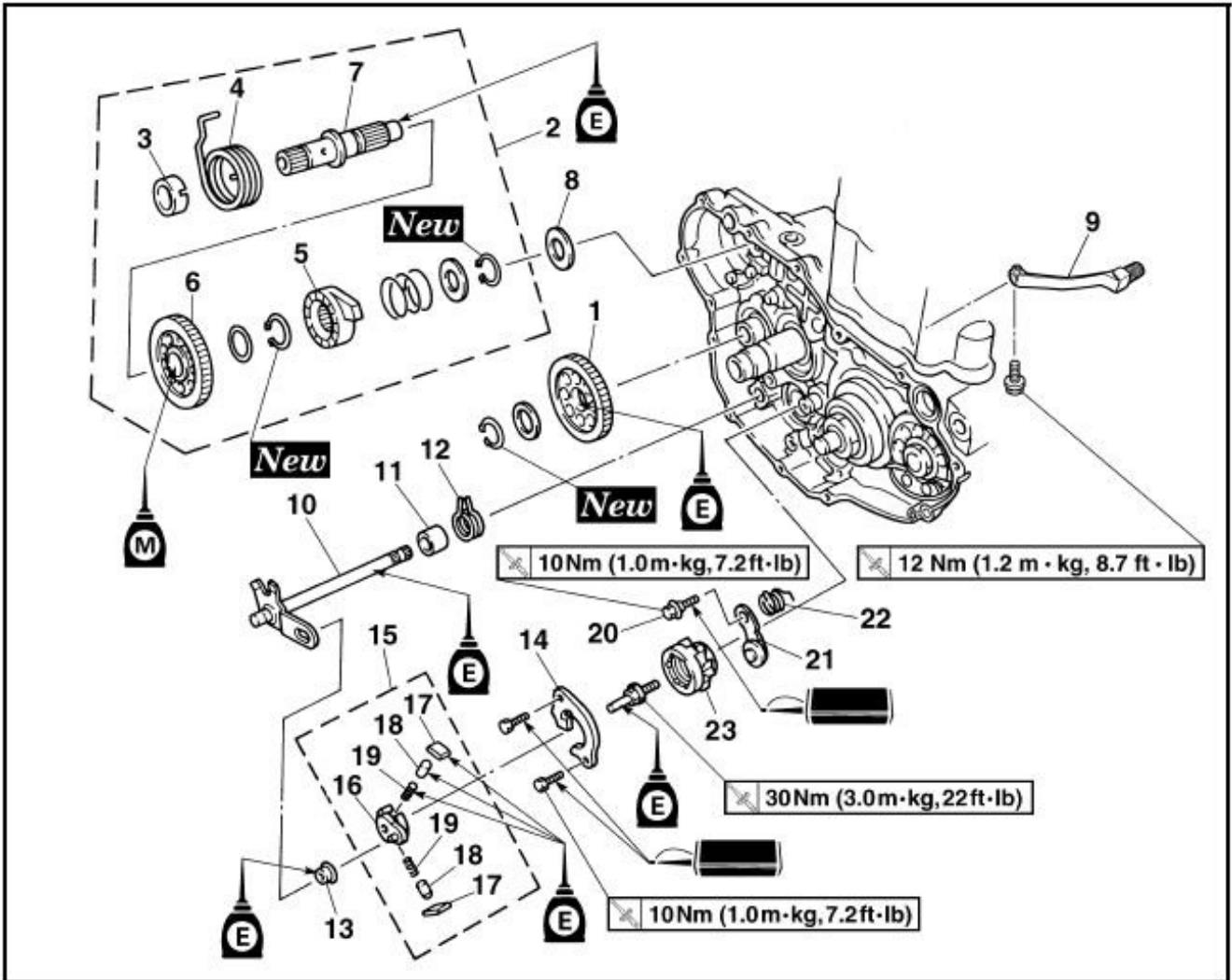
Apply the engine oil on the oil pump drive gear inner circumference.

---





11 KICK SHAFT AND SHIFT SHAFT

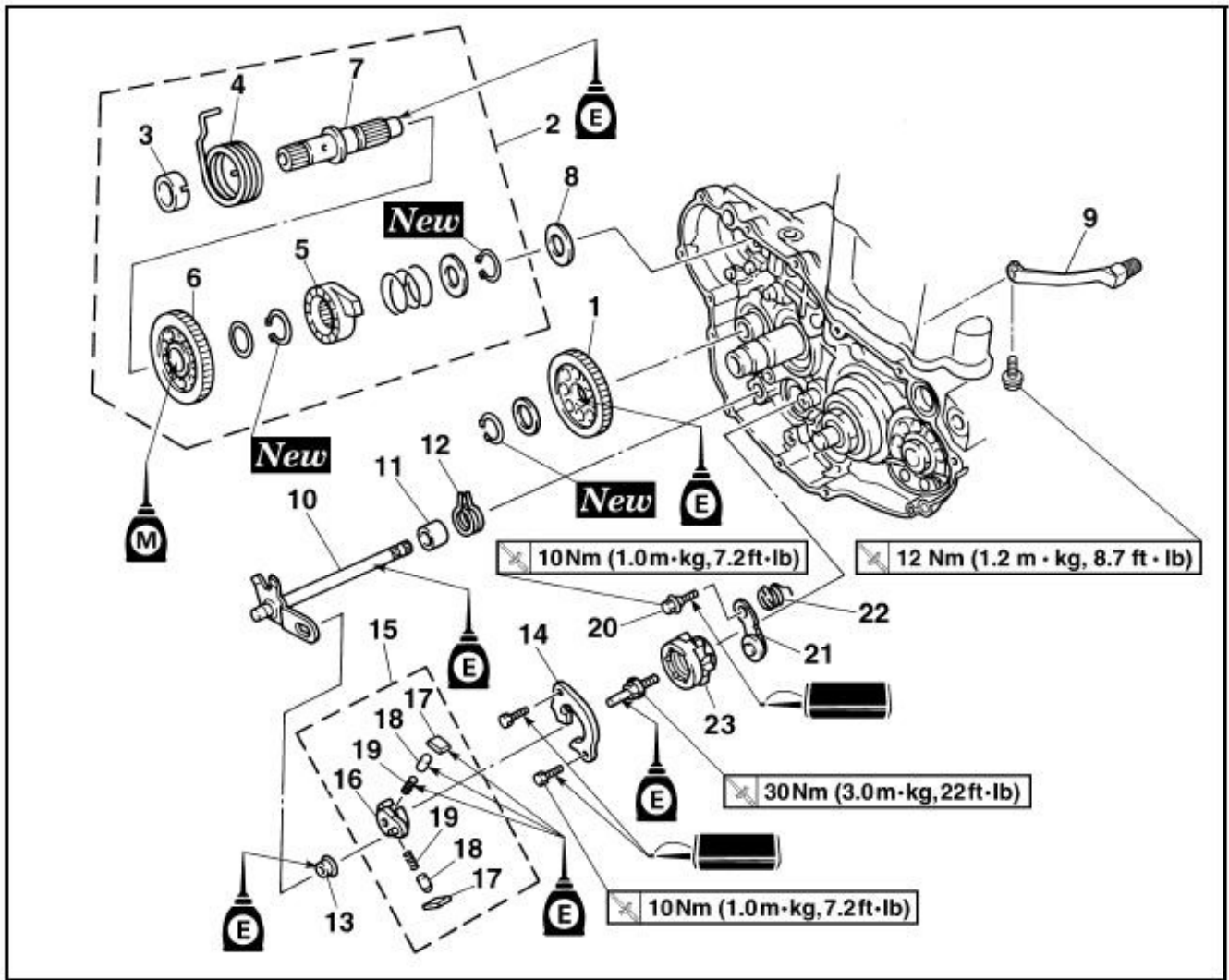


Extent of removal:

- ① Kick shaft removal
- ③ Shift shaft removal

- ② Kick shaft disassembly
- ④ Segment removal

Extent of removal	Order	Part name	Q'ty	Remarks
		<b>KICK SHAFT AND SHIFT SHAFT REMOVAL</b>		
Preparation for removal		Oil pump		Refer to "OIL PUMP" section.
① ↓	1	Kick idle gear	1	Refer to "REMOVAL POINTS".
② ↓	2	Kick shaft assembly	1	
	3	Spring guide	1	
	4	Torsion spring	1	
	5	Ratchet wheel	1	
	6	Kick gear	1	
	7	Kick shaft	1	
	8	Washer	1	
③ ↓	9	Shift pedal	1	
④ ↓	10	Shift shaft	1	
	11	Collar	1	

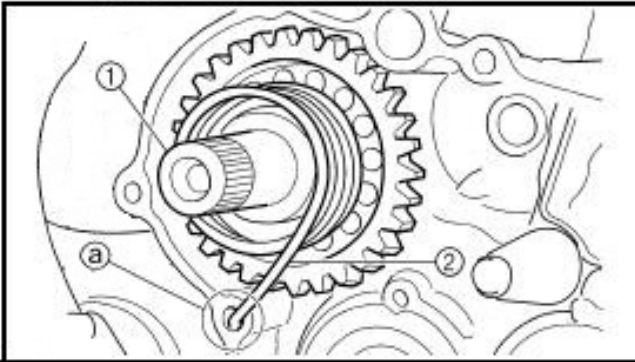


Extent of removal	Order	Part name	Q'ty	Remarks
③ ↓ ↑ ④ ↓	12	Torsion spring	1	Refer to "REMOVAL POINTS".
	13	Roller	1	
	14	Shift guide	1	
	15	Shift lever assembly	1	
	16	Shift lever	1	
	17	Pawl	2	
	18	Pawl pin	2	
	19	Spring	2	
	20	Bolt (stopper lever)	1	
	21	Stopper lever	1	
	22	Torsion spring	1	
	23	Segment	1	



## 11.1 Removal points

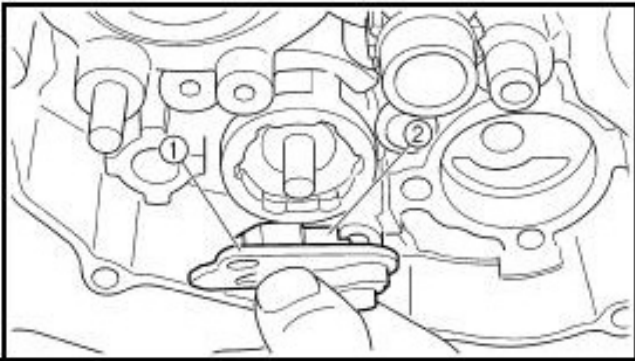
### 11.1.1 Kick shaft assembly



1. Remove:
  - Kick shaft assembly ①

**NOTE:** \_\_\_\_\_  
 Unhook the torsion spring ② from the hole ③ in the crankcase.

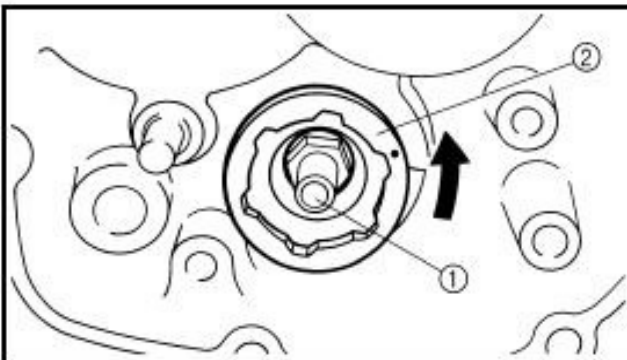
### 11.1.2 Shift guide and shift lever assembly



1. Remove:
  - Bolt (shift guide)
  - Shift guide ①
  - Shift lever assembly ②

**NOTE:** \_\_\_\_\_  
 The shift lever assembly is disassembled at the same time as the shift guide.

### 11.1.3 Segment

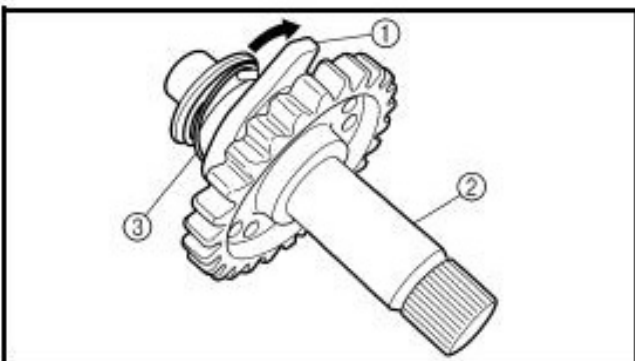


1. Remove:
  - Bolt (segment) ①
  - Segment ②

**NOTE:** \_\_\_\_\_  
 Turn the segment counterclockwise until it stops and loosen the bolt.

## 11.2 Inspection

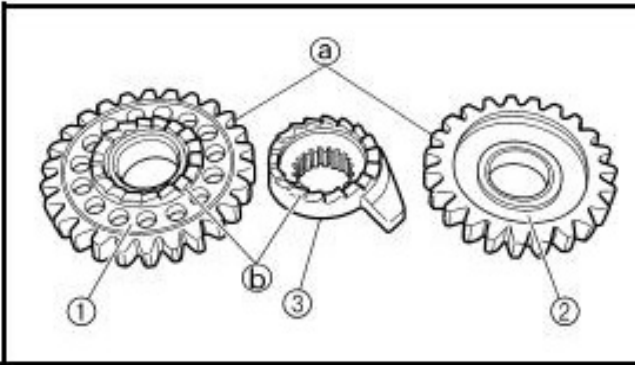
### 11.2.1 Kick shaft and ratchet wheel



1. Check:
  - Ratchet wheel ① smooth movement  
 Unsmooth movement → Replace.
  - Kick shaft ②  
 Wear/damage → Replace.
  - Spring ③  
 Broken → Replace.

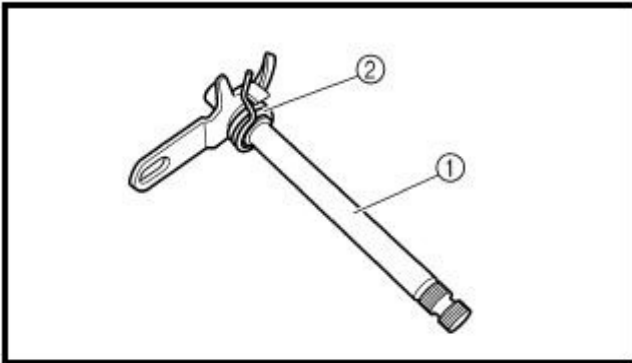


### 11.2.2 Kick gear, kick idle gear and ratchet wheel



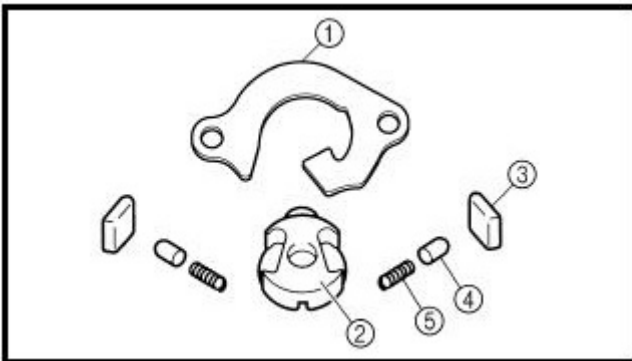
- Inspect:
  - Kick gear ①
  - Kick idle gear ②
  - Ratchet wheel ③
  - Gear teeth (a)
  - Ratchet teeth (b)
 Wear/damage → Replace.

### 11.2.3 Shift shaft



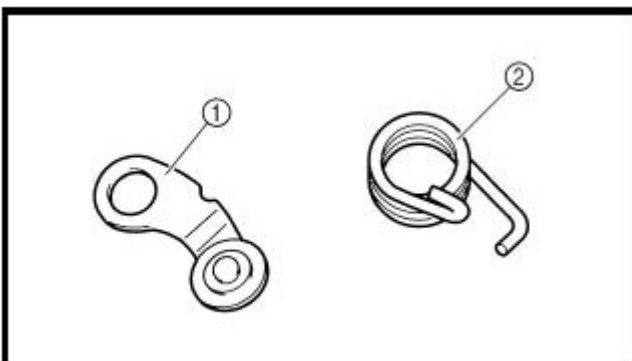
- Inspect:
  - Shift shaft ①
 Bend/damage → Replace.
  - Spring ②
 Broken → Replace.

### 11.2.4 Shift guide and shift lever assembly



- Inspect:
  - Shift guide ①
  - Shift lever ②
  - Pawl ③
  - Pawl pin ④
  - Spring ⑤
 Wear/damage → Replace.

### 11.2.5 Stopper lever

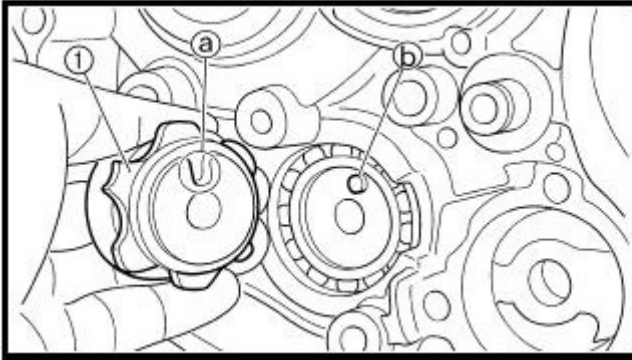


- Inspect:
  - Stopper lever ①
 Wear/damage → Replace.
  - Torsion spring ②
 Broken → Replace.




## 11.3 Assembly and installation

### 11.3.1 Segment



#### 1. Install:

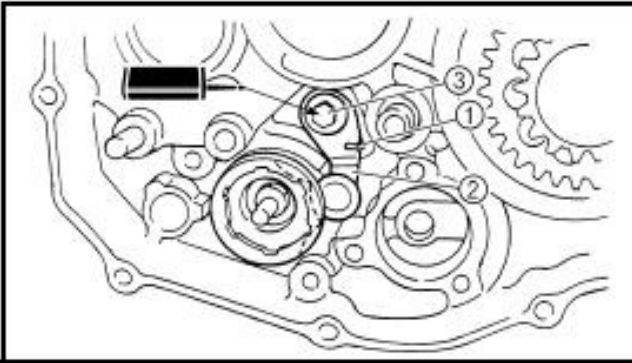
- Segment ①
- Bolt (segment)

 30 Nm (3.0 m · kg, 22 ft · lb)

#### NOTE:


Align the notch (a) on the segment with the pin (b) on the shift cam.

### 11.3.2 Stopper lever



#### 1. Install:

- Torsion spring ①
- Stopper lever ②
- Bolt (stopper lever) ③

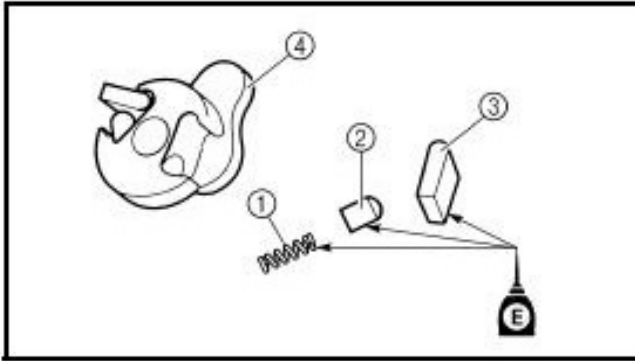
 10 Nm (1.0 m · kg, 7.2 ft · lb)

#### NOTE:

Align the stopper lever roller with the slot on segment.

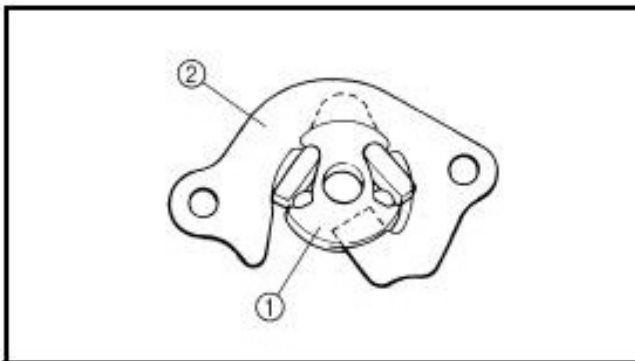


11.3.3 Shift guide and shift lever assembly

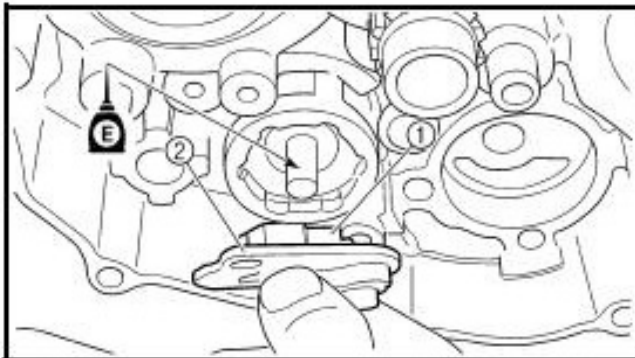


1. Install:
  - Spring ①
  - Pawl pin ②
  - Pawl ③
  - To shift lever ④.

**NOTE:** \_\_\_\_\_  
Apply the engine oil on the spring, pawl pin and pawl.

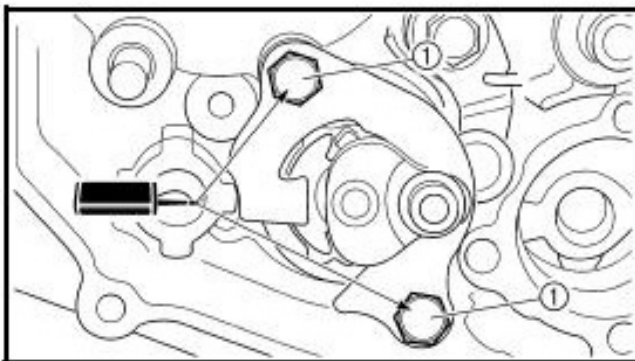


2. Install:
  - Shift lever assembly ①
  - To shift guide ②.



3. Install:
  - Shift lever assembly ①
  - Shift guide ②

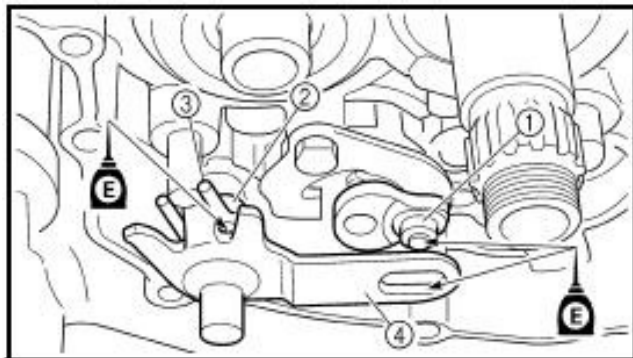
**NOTE:** \_\_\_\_\_  
• The shift lever assembly is installed at the same time as the shift guide.  
• Apply the engine oil on the bolt (segment) shaft.



4. Install:
    - Bolt (shift guide) ①
- 10 Nm (1.0 m · kg, 7.2 ft · lb)**



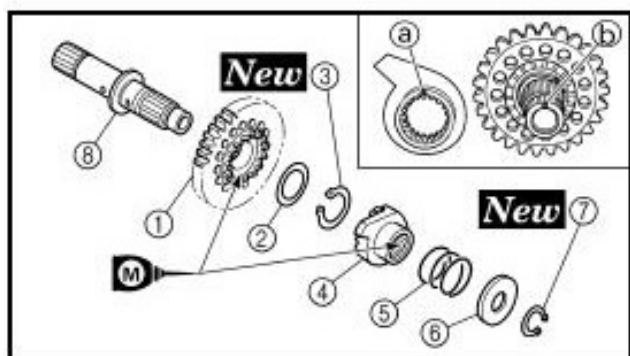
### 11.3.4 Shift shaft



1. Install:
  - Roller ①
  - Collar ②
  - Torsion spring ③
  - Shift shaft ④

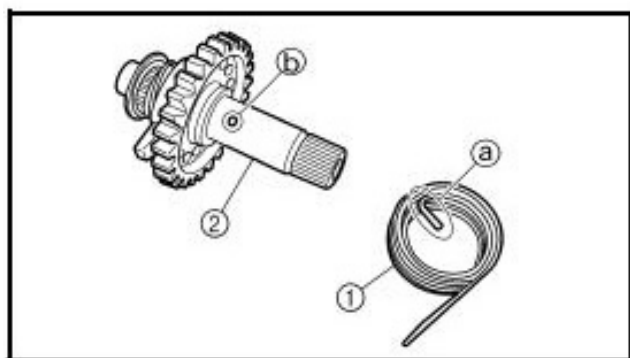
**NOTE:** \_\_\_\_\_  
Apply the engine oil on the roller and shift shaft.

### 11.3.5 Kick shaft assembly



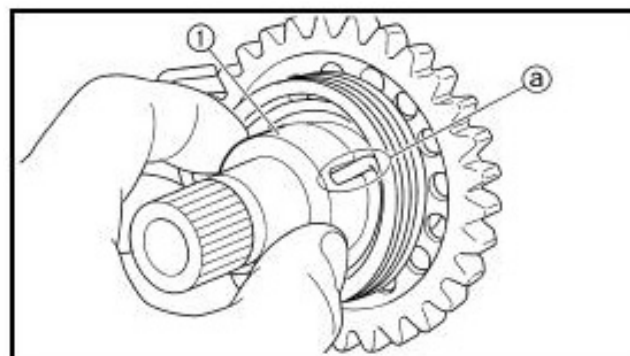
1. Install:
  - Kick gear ①
  - Washer ②
  - Circlip ③ **New**
  - Ratchet wheel ④
  - Spring ⑤
  - Washer ⑥
  - Circlip ⑦ **New**
 To kick shaft ⑧.

**NOTE:** \_\_\_\_\_  
• Apply the molybdenum disulfide oil on the inner circumferences of the kick gear and ratchet wheel.  
• Align the punch mark ① on the ratchet wheel with the punch mark ② on the kick shaft.



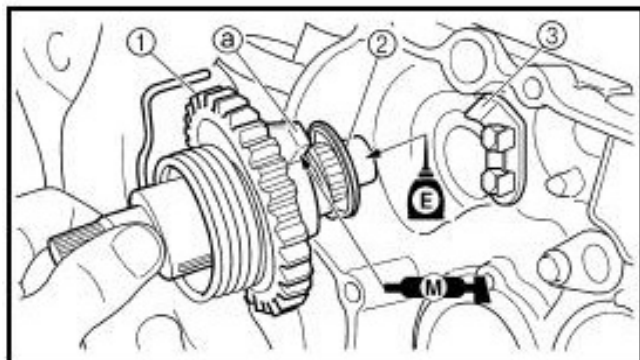
2. Install:
  - Torsion spring ①
 To kick shaft ②.

**NOTE:** \_\_\_\_\_  
Make sure the stopper ① of the torsion spring fits into the hole ② on the kick shaft.



3. Install:
  - Spring guide ①

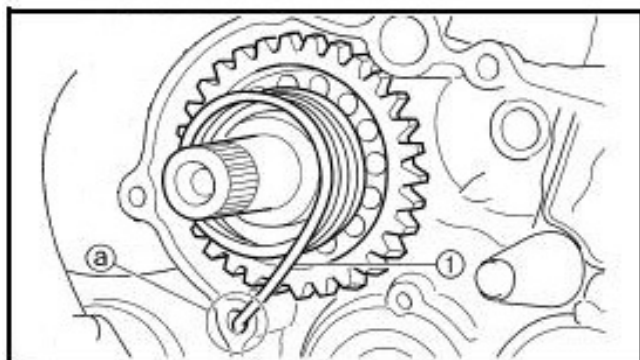
**NOTE:** \_\_\_\_\_  
Slide the spring guide into the kick shaft, make sure the groove ① in the spring guide fits on the stopper of the torsion spring.



4. Install:
  - Kick shaft assembly ①
  - Washer ②

**NOTE:**

- Apply the molybdenum disulfide grease on the contacting surfaces of the kick shaft stopper ① and kick shaft ratchet wheel guide ③.
- Apply the engine oil on the kick shaft.
- Slide the kick shaft assembly into the crankcase and make sure the kick shaft stopper ① fits into the kick shaft ratchet wheel guide.

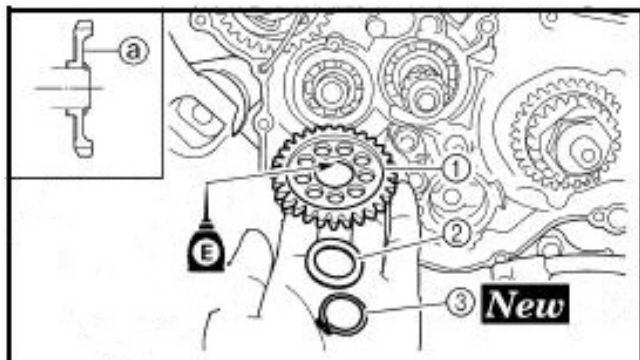


5. Hook:
  - Torsion spring ①

**NOTE:**

Turn the torsion spring clockwise and hook into the proper hole ① in the crankcase.

### 11.3.6 Kick idle gear



1. Install:
  - Kick idle gear ①
  - Washer ②
  - Circlip ③ **New**

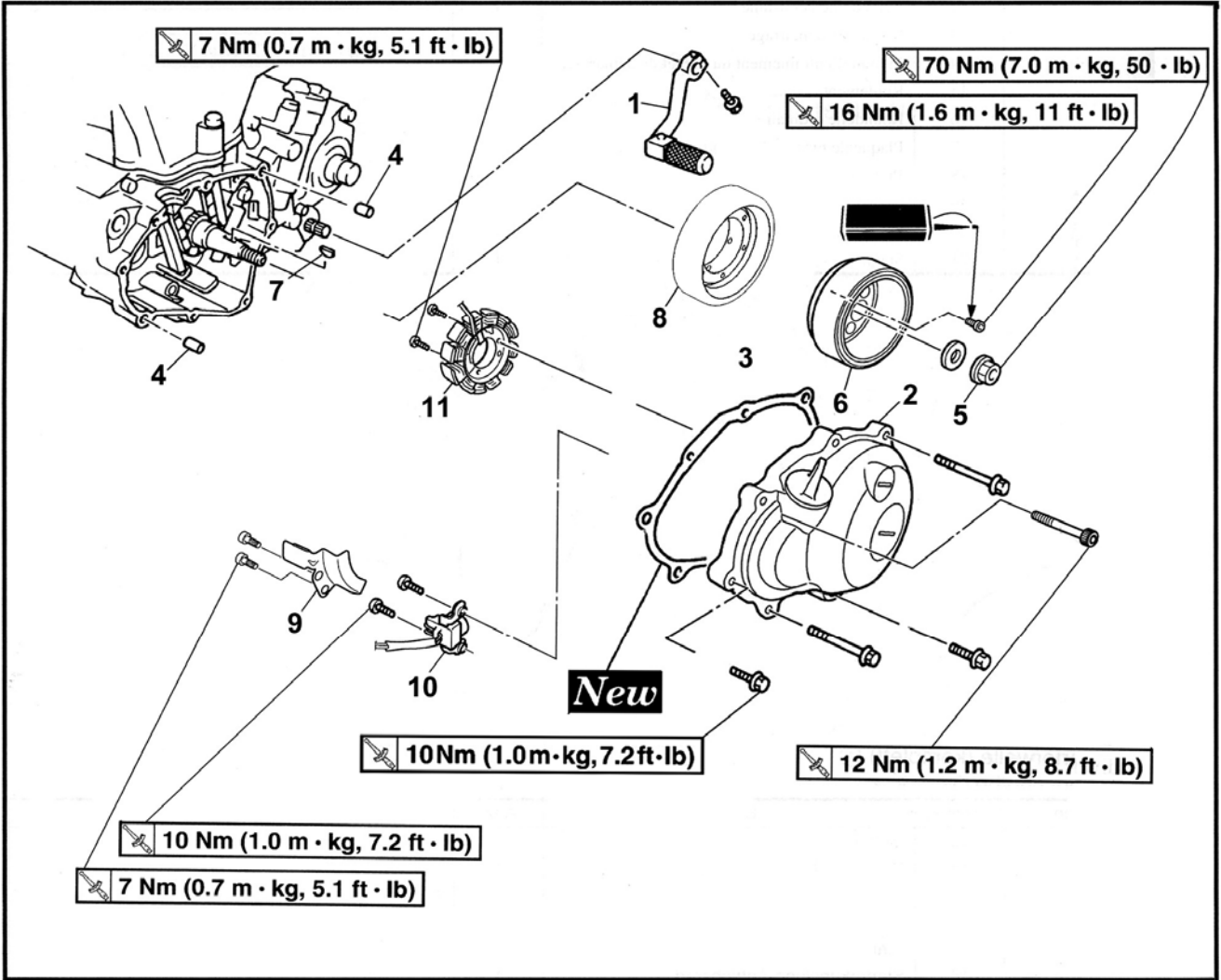
**NOTE:**

- Apply the engine oil on the kick idle gear inner circumference.
- Install the kick idle gear with its depressed side ① toward you.





12 AC MAGNETO



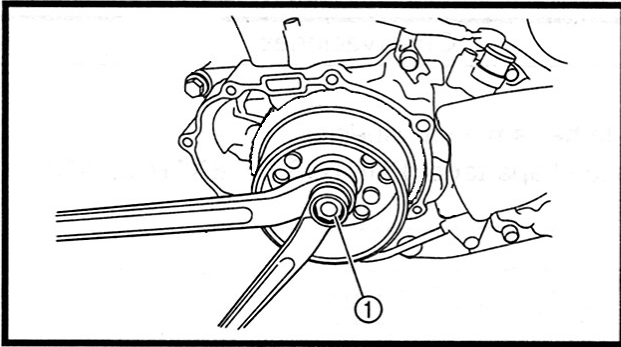
Extent of removal: ① AC magneto removal

Extent of removal	Order	Part name	Q'ty	Remarks
Preparation for removal		<b>AC MAGNETO REMOVAL</b>		
		Drain the engine oil		
		Disconnect the AC magneto lead		
①	1	Shift pedal	1	Use special tool. Refer to "REMOVAL POINTS".
	2	Crankcase cover (left)	1	
	3	Gasket	1	
	4	Dowel pin	2	
	5	Nut (rotor)	1	
	6	Rotor	1	
	7	Woodruff key	1	
	8	Flywheel weight	1	
	9	Holder	1	
	10	Pick up coil	1	
	11	Stator	1	

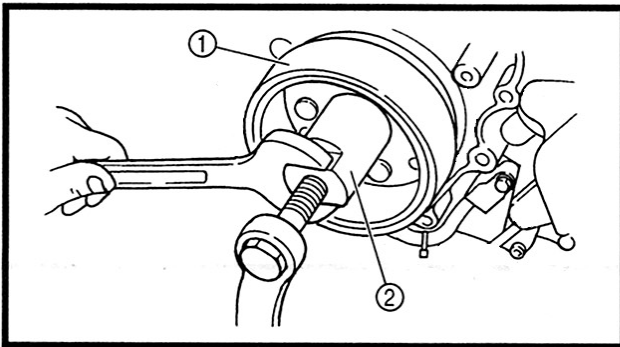


## 12.1 Removal points

### 12.1.1 Rotor



1. Remove:
  - Nut (rotor) ①
  - Plain washer



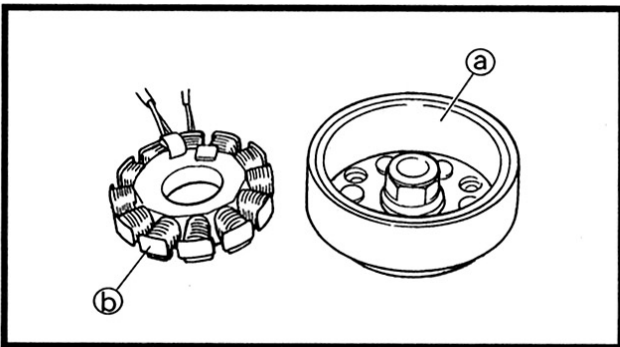
2. Remove:
  - Rotor ①
 Use the rotor puller ②.



**Rotor puller:**  
YM-04141/90890-04141

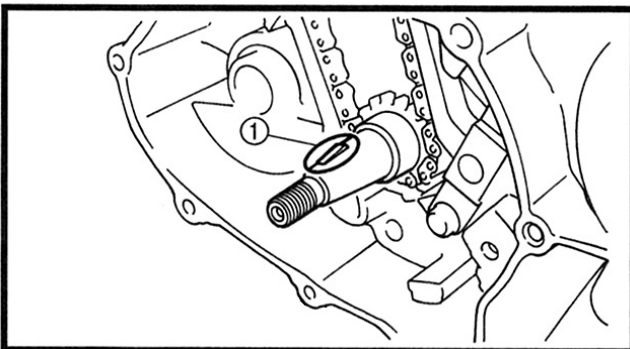
## 12.2 Inspection

### 12.2.1 AC Magneto



1. Inspect:
  - Rotor inner surface ①
  - Stator outer surface ②
 Damage → Inspect the crankshaft runout and crankshaft bearing.  
If necessary, replace AC magneto and/or stator.

### 12.2.2 Woodruff key

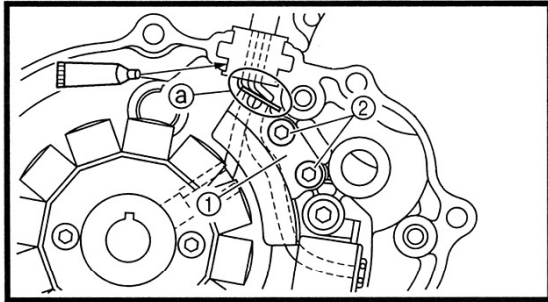
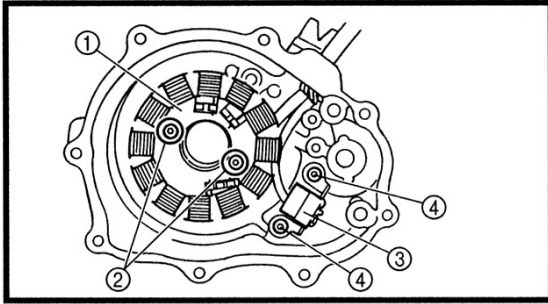


1. Inspect:
  - Woodruff key ①
 Damage → Replace.



12.3 Assembly and installation

12.3.1 AC Magneto



1. Install:

- Stator ①
- Bolt (stator) ②
- Pickup coil ③
- Bolt (pickup coil) ④

7 Nm (0.7 m · kg, 5.1 ft · lb)

10 Nm (1.0 m · kg, 7.2 ft · lb)

2. Install:

- Holder ①
- Bolt ②

7 Nm (0.7 m · kg, 5.1 ft · lb)

**CAUTION:**

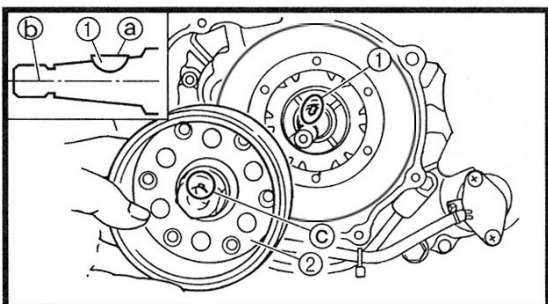
Pass the pickup coil lead and charging coil lead under the holder while taking care not to allow these leads to get caught with each other. Also take care to pass the leads so that they do not become loose at the bend of the holder ①

**NOTE:**

Apply the sealant to the grommet of the AC magneto lead.



**Quick gasket®:**  
**ACC-QUICK-GS-KT**  
**YAMAHA Bond No. 1215:**  
**90890-85505**

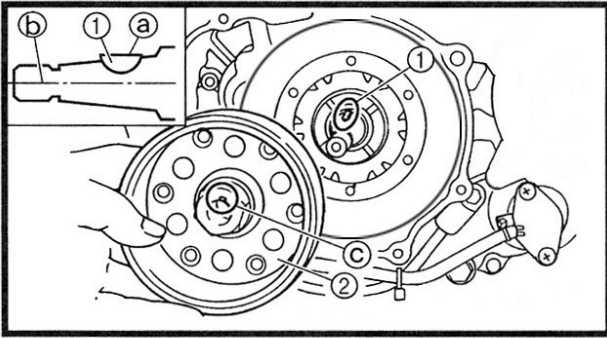


3. Install:

- Woodruff key ①
- Rotor ②

**NOTE:**

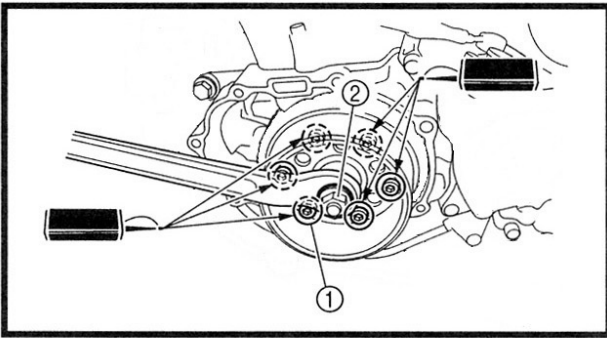
- Clean the tapered portions of the crankshaft and rotor.
- When installing the woodruff key, make sure that its flat surface ① is in parallel with the crankshaft center line ②.
- When installing the rotor, align the keyway ③ of the rotor with the woodruff key.



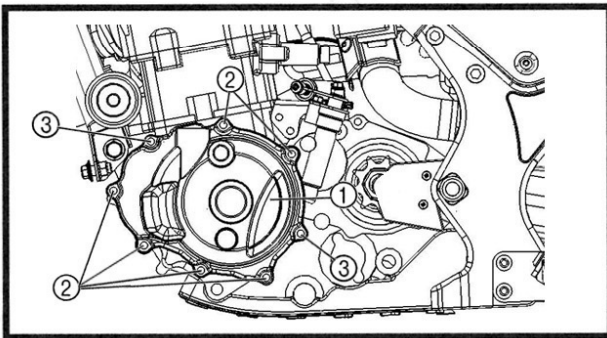
3. Install:
  - Woodruff key ①
  - Rotor ②

**NOTE:**

- Clean the tapered portions of the crankshaft and rotor.
- When installing the woodruff key, make sure that its flat surface ① is in parallel with the crankshaft center line ②.
- When installing the rotor, align the keyway ③ of the rotor with the woodruff key.



4. Install:
    - Bolt ①
    - Plain washer (rotor)
    - Nut (rotor) ②
- |  |                                       |
|--|---------------------------------------|
|  | <b>16 Nm (1.6 m · kg, 11 ft · lb)</b> |
|--|---------------------------------------|
- |  |                                       |
|--|---------------------------------------|
|  | <b>70 Nm (7.0 m · kg, 50 ft · lb)</b> |
|--|---------------------------------------|



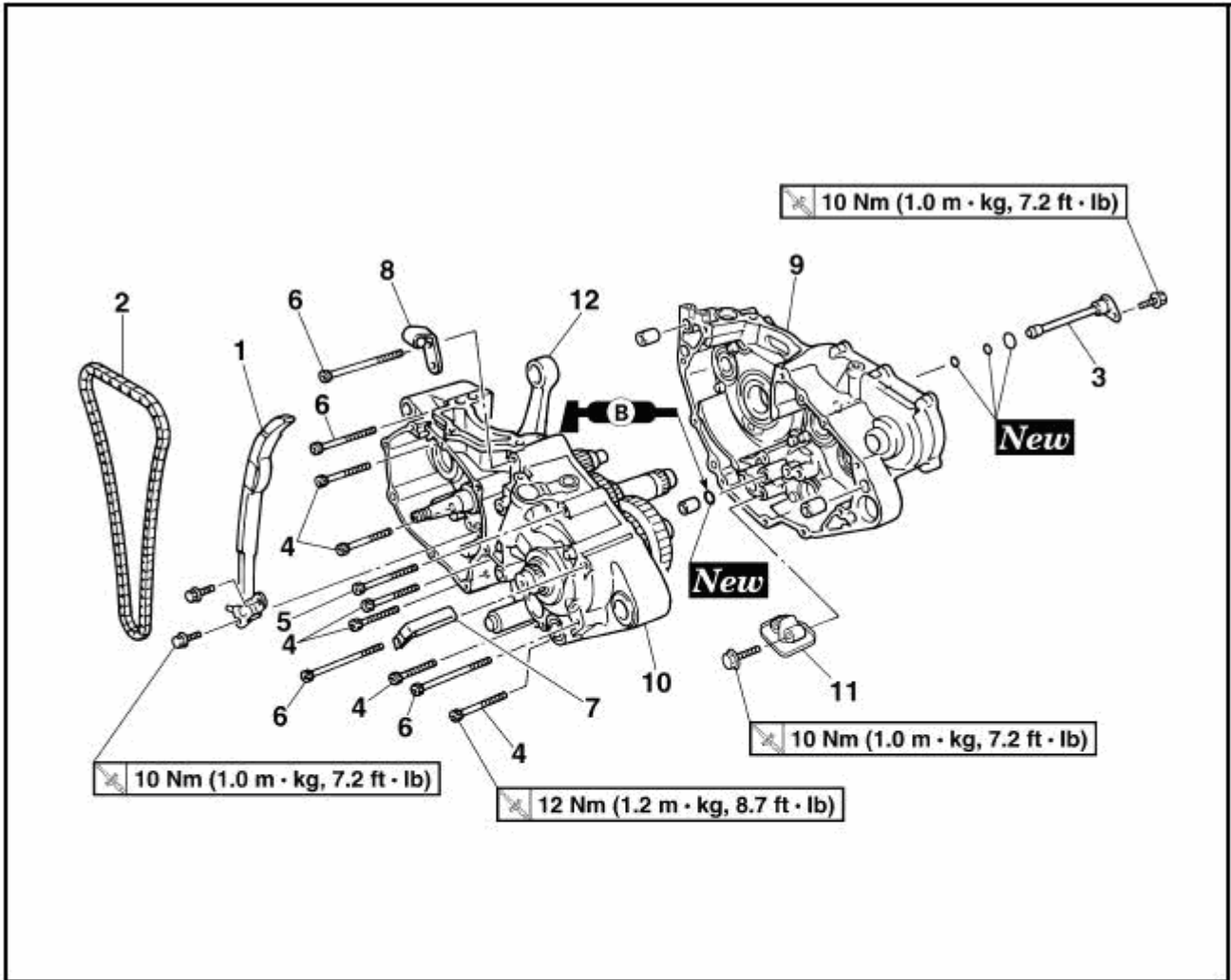
5. Install:
    - Dowel pin
    - Gasket [crankcase cover (left)]
    - Crankcase cover (left) ①
    - Bolt [crankcase cover (left)] ②
    - Bolt [crankcase cover (left)] ③
- |  |  |
|--|--|
|  | <b>10 Nm (1.0 m · kg, 7.2 ft · lb)</b> |
|--|--|
- |  |  |
|--|--|
|  | <b>12 Nm (1.2 m · kg, 8.7 ft · lb)</b> |
|--|--|

**NOTE:**

Tighten the bolts in stage, using a crisscross pattern.

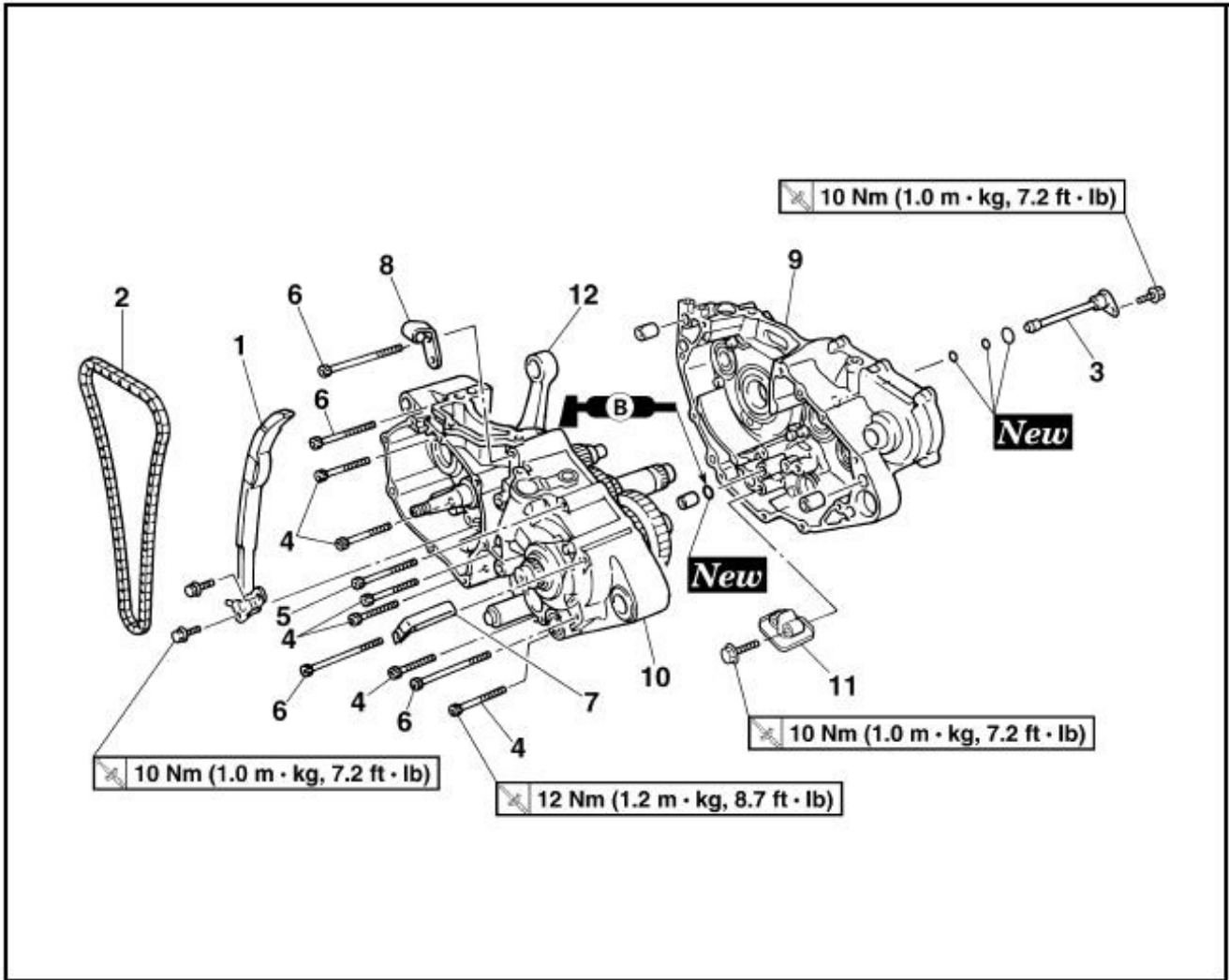


### 13 CRANKCASE AND CRANKSHAFT



Extent of removal:                      ① Crankcase separation                      ② Crankshaft removal

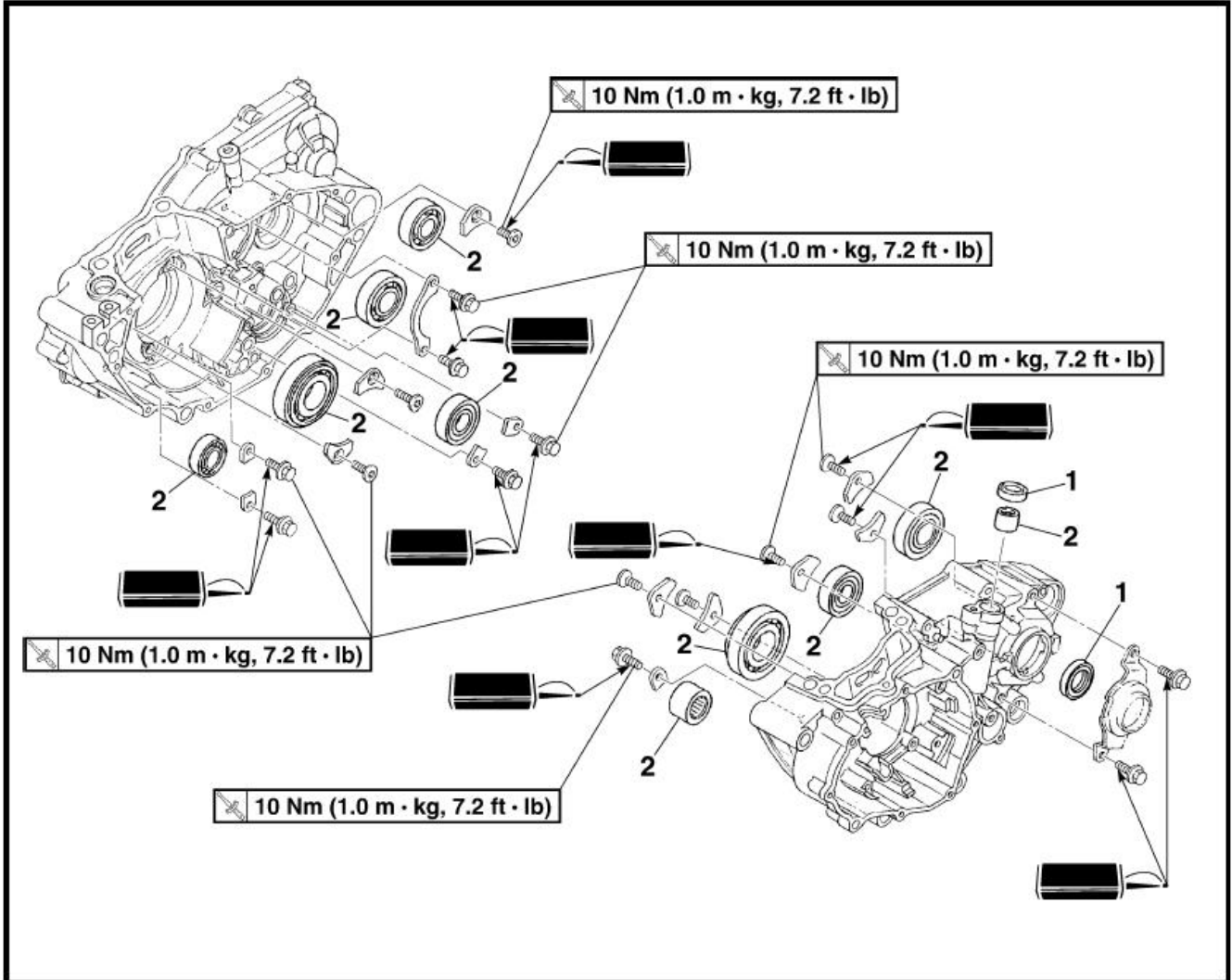
Extent of removal	Order	Part name	Q'ty	Remarks
Preparation for removal		<b>CRANKCASE AND CRANK-SHAFT REMOVAL</b>		
		Engine		Refer to "ENGINE REMOVAL" section.
		Piston		Refer to "CYLINDER AND PISTON" section.
		Kick shaft assembly		Refer to "KICK SHAFT AND SHIFT SHAFT" section.
		Segment		Refer to "AC MAGNETO" section.
		Stator		Refer to "BALANCER" section.
		Balancer shaft		
①	1	Timing chain guide (intake side)	1	
②	2	Timing chain	1	
	3	Oil delivery pipe 2	1	



Extent of removal	Order	Part name	Q'ty	Remarks
	4	Bolt [L = 45 mm (1.77 in)]	6	Refer to "REMOVAL POINTS".  Use special tool. Refer to "REMOVAL POINTS".
	5	Bolt [L = 55 mm (2.17 in)]	1	
	6	Bolt [L = 70 mm (2.76 in)]	4	
	7	Hose guide	1	
	8	Clutch cable holder	1	
	9	Right crankcase	1	
	10	Left crankcase	1	
	11	Oil strainer	1	
	12	Crankshaft	1	



13.1 Crankcase bearing



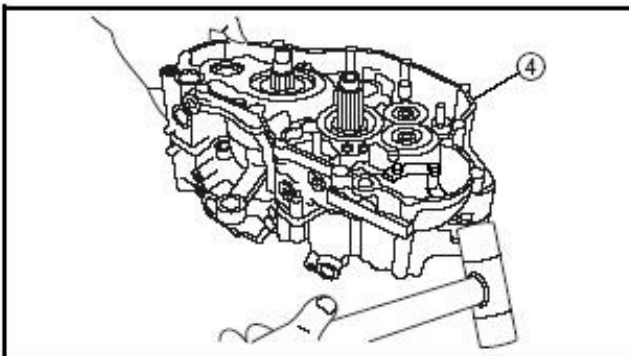
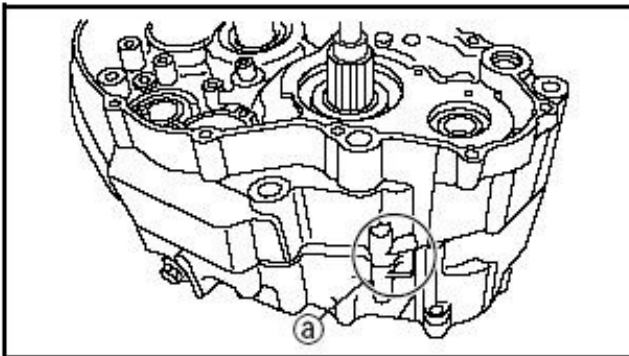
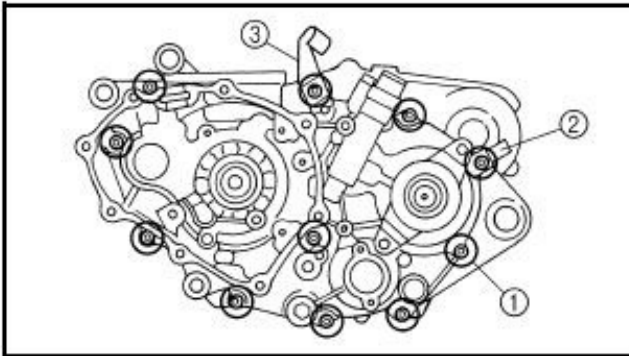
Extent of removal: ① Crankcase bearing removal

Extent of removal	Order	Part name	Q'ty	Remarks
Preparation for removal		<b>CRANKCASE BEARING REMOVAL</b> Transmission Shift cam and shift fork		Refer to "TRANSMISSION, SHIFT CAM AND SHIFT FORK" section.
①	1	Oil seal	2	
	2	Bearing	10	Refer to "REMOVAL POINTS".



## 13.2 Removal points

### 13.2.1 Crankcase



1. Separate:
  - Right crankcase
  - Left crankcase

#### Separation steps:

- Remove the crankcase bolts ①, hose guide ② and clutch cable holder ③.

#### NOTE:

Loosen each bolt 1/4 of a turn at a time and after all the bolts are loosened, remove them.

- Remove the right crankcase ④.

#### NOTE:

- Place the crankcase with its left side downward and split it by inserting a screwdriver tip into the splitting slit (a) in the crankcase.
- Lift the right crankcase horizontally while lightly patting the case splitting slit and engine mounting boss using a soft hammer, and leave the crankshaft and transmission with the left crankcase.

#### CAUTION:

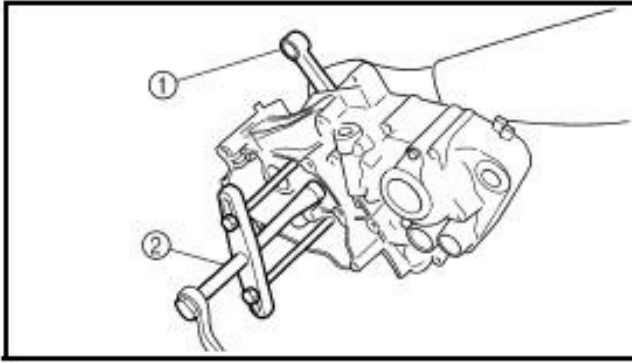
Use soft hammer to tap on the case half. Tap only on reinforced portions of case. Do not tap on gasket mating surface. Work slowly and carefully. Make sure the case halves separate evenly. If one end "hangs up", take pressure off the push screw, realign, and start over. If the cases do not separate, check for a remaining case screw or fitting. Do not force.

- Remove the dowel pins and O-ring.





### 13.2.2 Crankshaft



1. Remove:
  - Crankshaft ①
  - Use the crankcase separating tool ②.

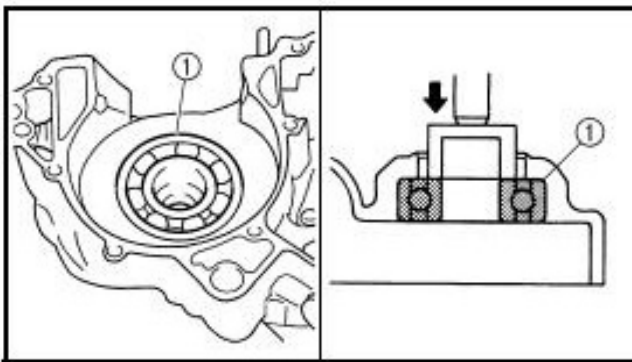


Crankcase separating tool:  
YU-1135-A/90890-01135

#### CAUTION:

Do not use a hammer to drive out the crankshaft.

### 13.2.3 Crankcase bearing



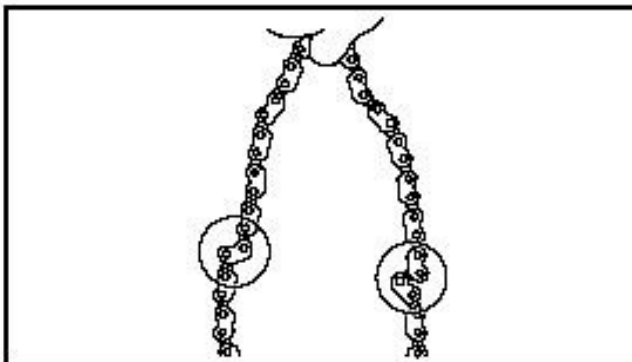
1. Remove:
  - Bearing ①

#### NOTE:

- Remove the bearing from the crankcase by pressing its inner race.
- Do not use the removed bearing.

## 13.3 Inspection

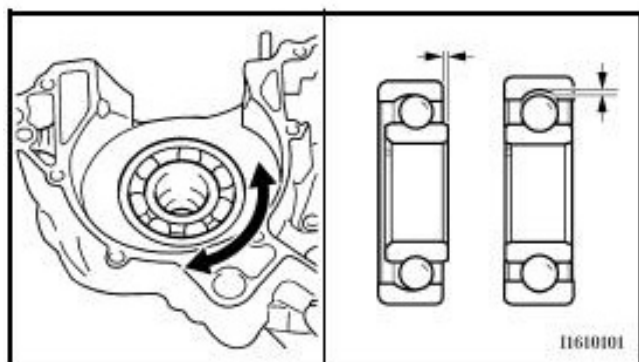
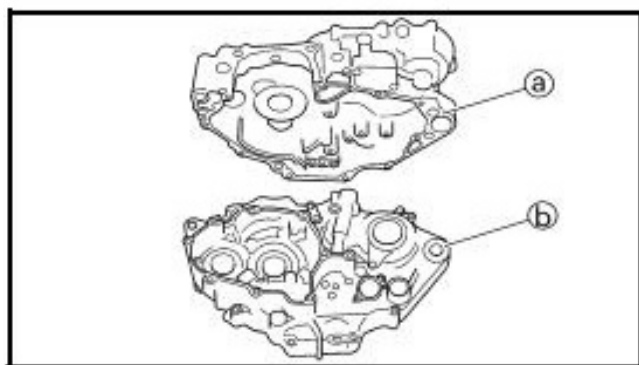
### 13.3.1 Timing chain and timing chain guide



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

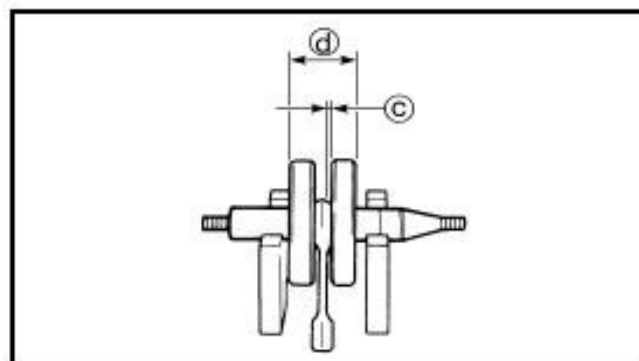
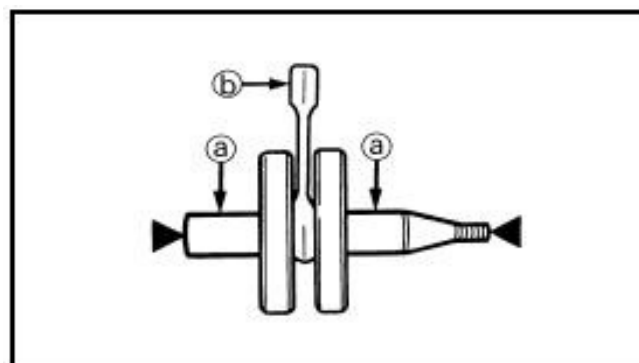


13.3.2 Crankcase





1. Inspect:
  - Contacting surface (a)  
Scratches → Replace.
  - Engine mounting boss (b), crankcase  
Cracks/damage → Replace.
2. Inspect:
  - Bearing  
Rotate inner race with a finger.  
Rough spot/seizure → Replace.
3. Inspect:
  - Oil seal  
Damage → Replace.

13.3.3 Crankshaft



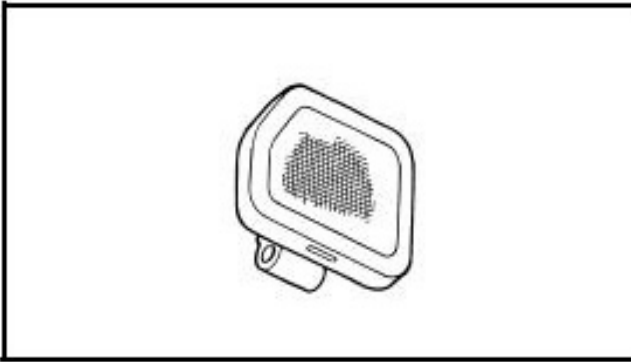
1. Measure:
  - Runout limit (a)
  - Small end free play limit (b)
  - Connecting rod big end side clearance (c)
  - Crank width (d)  
Out of specification → Replace.  
Use the dial gauge and a thickness gauge.

 Dial gauge and stand:  
YU-3097/90890-01252

	Standard	<Limit>
Runout limit:	0.03 mm (0.0012 in)	0.05 mm (0.002 in)
Small end free play:	0.4 ~ 1.0 mm (0.016 ~ 0.039 in)	2.0 mm (0.08 in)
Side clearance:	0.15 ~ 0.45 mm (0.0059 ~ 0.0177 in)	0.50 mm (0.02 in)
Crack width:	55.95 ~ 56.00 mm (2.203 ~ 2.205 in)	—

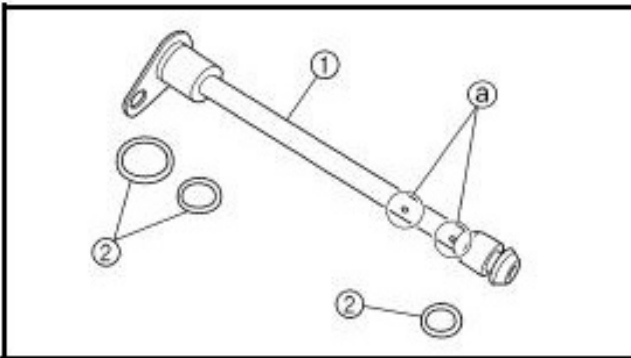


### 13.3.4 Oil strainer



- Inspect:
  - Oil strainer
  - Damage → Replace.

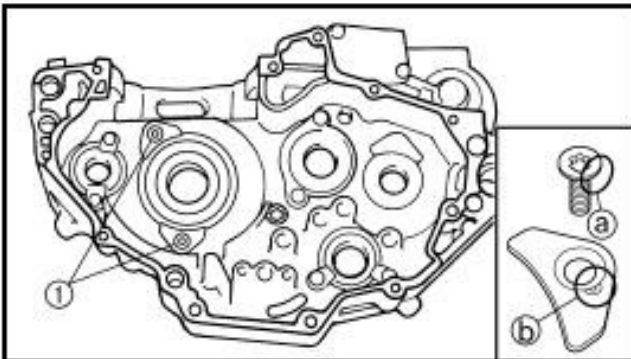
### 13.3.5 Oil delivery pipe 2



- Inspect:
  - Oil delivery pipe 2 ①
  - O-ring ②
  - Damage → Replace.
  - Oil orifice ③
  - Clogged → Blow.

## 13.4 Assembly and installation

### 13.4.1 crankcase bearing



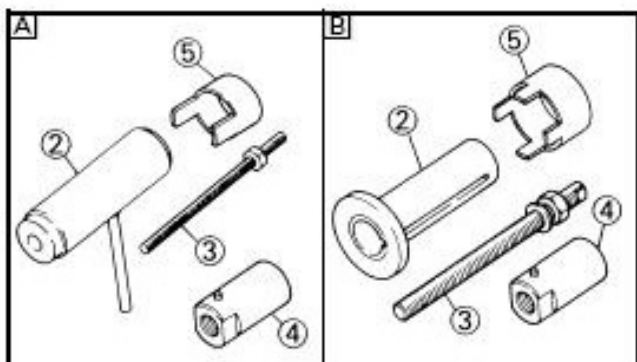
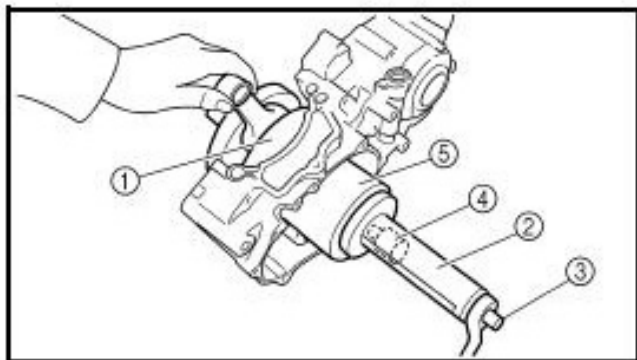
- Install:
  - Bearing **New**
  - Bearing stopper
  - Bolt (bearing stopper)
    - 10 Nm (1.0 m · kg, 7.2 ft · lb)
  - Screw (bearing stopper)
    - 10 Nm (1.0 m · kg, 7.2 ft · lb)
  - Screw [bearing stopper (crankshaft)] ①
    - 10 Nm (1.0 m · kg, 7.2 ft · lb)
 To left and right crankcase.

**NOTE:** \_\_\_\_\_

- Install the bearing by pressing its outer race parallel.
- To prevent the screw [bearing stopper (crankshaft)] from becoming loose, crush the screw head periphery ③ into the concave ④ using a punch etc. In so doing, take care not to damage the screwdriver receiving hole in the screw head.



## 13.4.2 Cranshaft



## 1. Install:

- Crankshaft ①  
Use the crankshaft installing tool ②, ③, ④ and ⑤.



Crankshaft installing pot ②:  
YU-90050/90890-01274

Crankshaft installing bolt ③:  
YU-90050/90890-01275

Adapter (M12) ④:  
YU-90063/90890-01278

Spacer (crankshaft installer) ⑤:  
YU-91044/90890-04081

**A** For USA and CDN

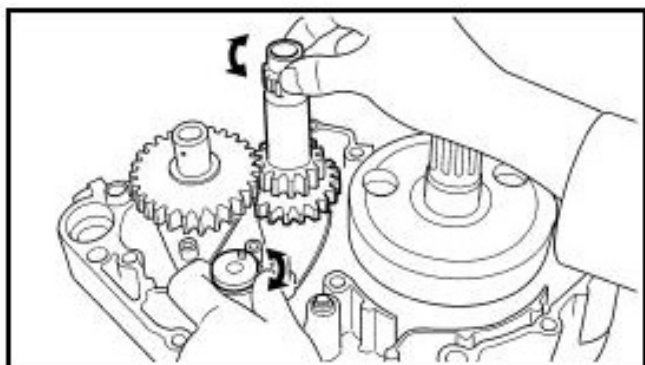
**B** Except for USA and CDN

**NOTE:**

- Hold the connecting rod at top dead center 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.
- Before installing the crankshaft, clean the contacting surface of crankcase.

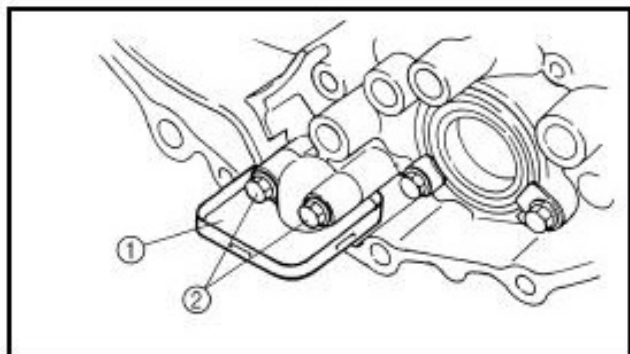
**CAUTION:**

Do not use a hammer to drive in the crankshaft.



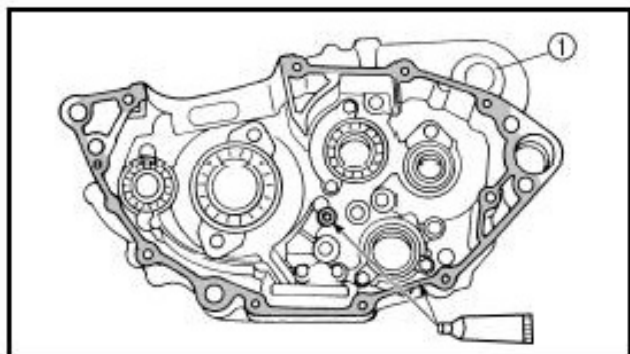
## 2. Check:

- Shifter operation
- Transmission operation  
Unsmooth operation → Repair.



3. Install:
- Oil strainer ①
  - Bolt (oil strainer) ②

10 Nm (1.0 m · kg, 7.2 ft · lb)

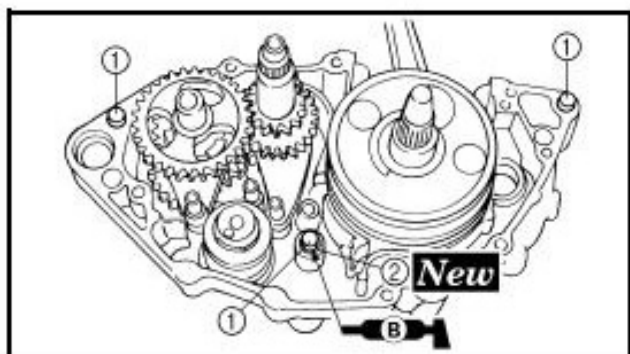


4. Apply:
- Sealant
- On the right crankcase ①.



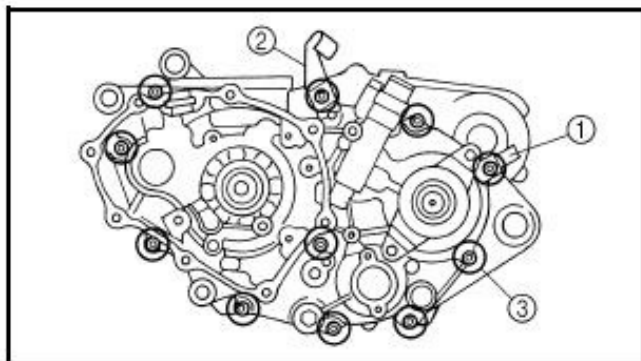
Quick gasket<sup>®</sup>:  
ACC-QUICK-GS-KT  
YAMAHA Bond No. 1215:  
90890-85505

**NOTE:** \_\_\_\_\_  
Clean the contacting surface of left and right crankcase before applying the sealant.



5. Install:
- Dowel pin ①
  - O-ring ② **New**
  - Right crankcase
- To left crankcase.

**NOTE:** \_\_\_\_\_  
• Fit the right crankcase onto the left crankcase. Tap lightly on the case with soft hammer.  
• When installing the crankcase, the connecting rod should be positioned at TDC (top dead center).



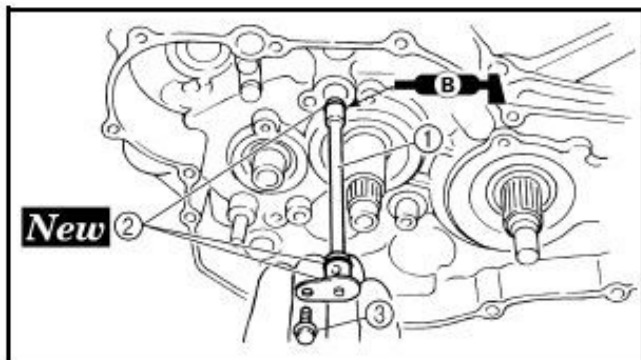
## 6. Tighten:

- Hose guide ①
- Clutch cable holder ②
- Bolt (crankcase) ③

12 Nm (1.2 m · kg, 8.7 ft · lb)

**NOTE:**

Tighten the crankcase tightening bolts in stage, using a crisscross pattern.



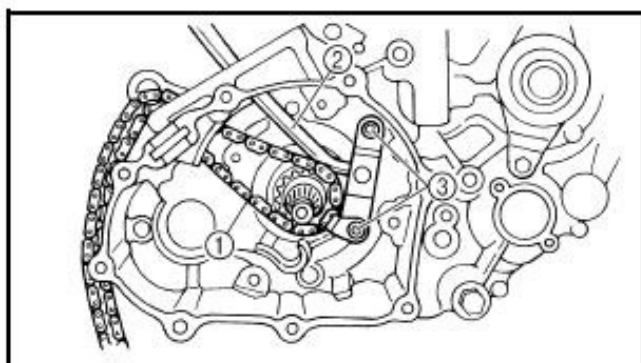
## 7. Install:

- Oil delivery pipe 2 ①
- O-ring ② **New**
- Bolt (oil delivery pipe 2) ③

10 Nm (1.0 m · kg, 7.2 ft · lb)

**NOTE:**

Apply the lithium soap base grease on the O-rings.



## 8. Install:

- Timing chain ①
- Timing chain guide (intake side) ②
- Bolt (timing chain guide) ③

10 Nm (1.0 m · kg, 7.2 ft · lb)

## 9. Remove:

- Sealant

Forced out on the cylinder mating surface.

## 10. Apply:

- Engine oil

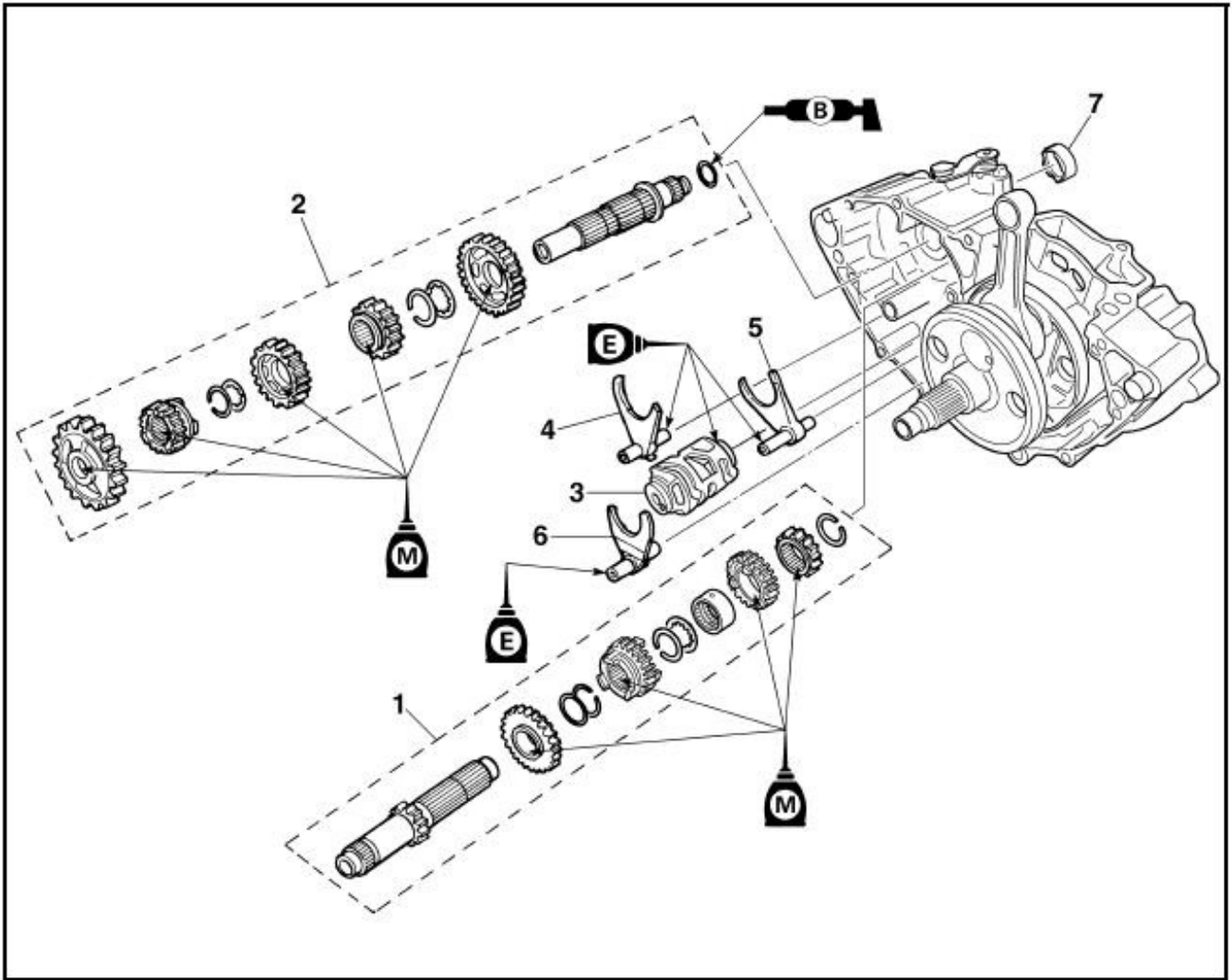
To the crank pin, bearing and oil delivery hole.

## 11. Check:

- Crankshaft and transmission operation.  
Unsmooth operation → Repair.



14 TRANSMISSION



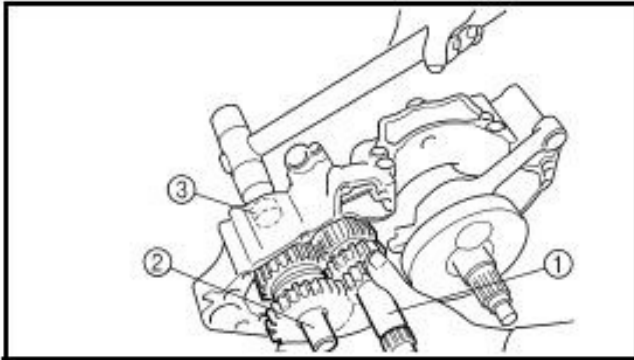
Extent of removal: ① Shift fork, shift cam, main axle and drive axle removal

Extent of removal	Order	Part name	Q'ty	Remarks
Preparation for removal		<b>TRANSMISSION, SHIFT CAM AND SHIFT FORK REMOVAL</b> Engine Separate the crankcase.		Refer to "ENGINE REMOVAL" section. Refer to "CRANKCASE AND CRANK-SHAFT" section.
①	1	Main axle	1	Refer to "REMOVAL POINTS".
	2	Drive axle	1	
	3	Shift cam	1	
	4	Shift fork 3	1	
	5	Shift fork 2	1	
	6	Shift fork 1	1	
	7	Collar	1	



## 14.1 Removal points

### 14.1.1 Transmission



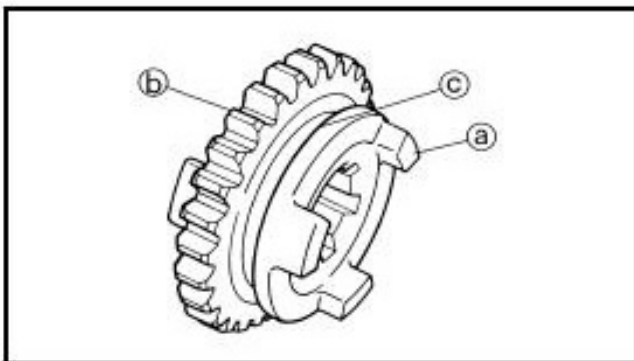
1. Remove:
  - Main axle ①
  - Drive axle ②
  - Shift cam
  - Shift fork 3
  - Shift fork 2
  - Shift fork 1

#### NOTE:

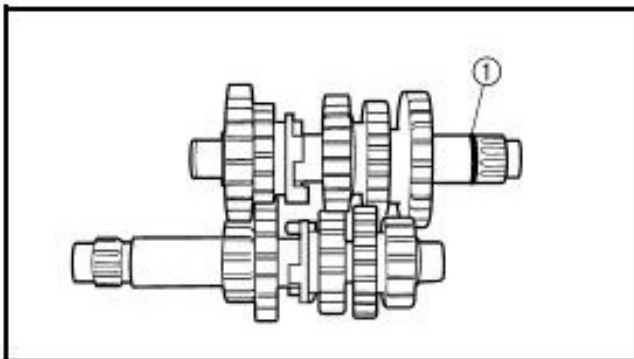
- Remove assembly with the collar ③ installed to the crankcase.
- Remove assembly carefully. Note the position of each part. Pay particular attention to the location and direction of shift forks.
- Remove the main axle, drive axle, shift cam and shift fork all together by tapping lightly on the transmission drive axle with a soft hammer.

## 14.2 Inspection

### 14.2.1 Gears



1. Inspect:
  - Matching dog ①
  - Gear teeth ②
  - Shift fork groove ③
 Wear/damage → Replace.

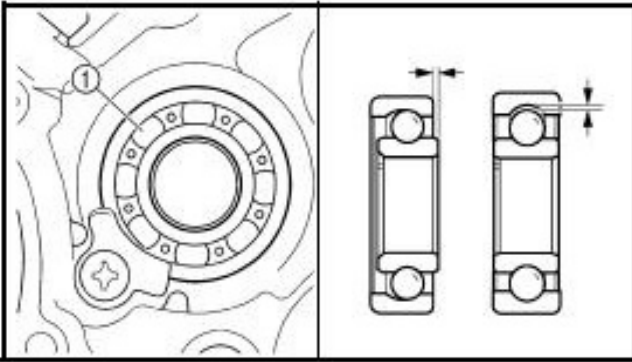


2. Inspect:
  - O-ring ①
 Damage → Replace.
3. Check:
  - Gears movement
 Unsmooth movement → Repair or replace.



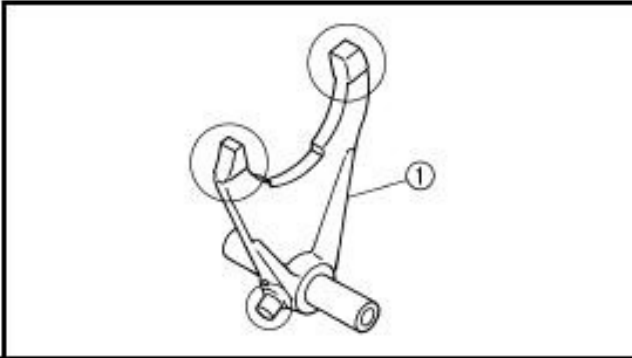


### 14.2.2 Bearing

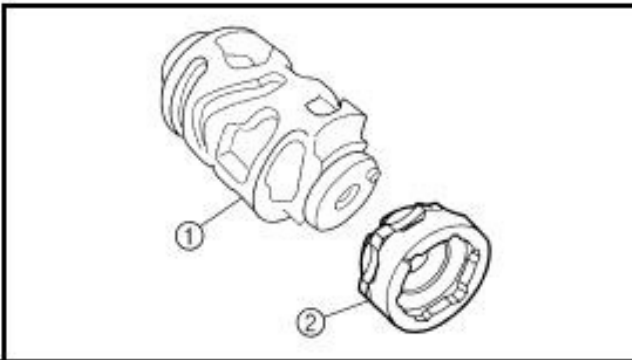


1. Inspect:
  - Bearing ①  
Rotate inner race with a finger.  
Rough spot/seizure → Replace.

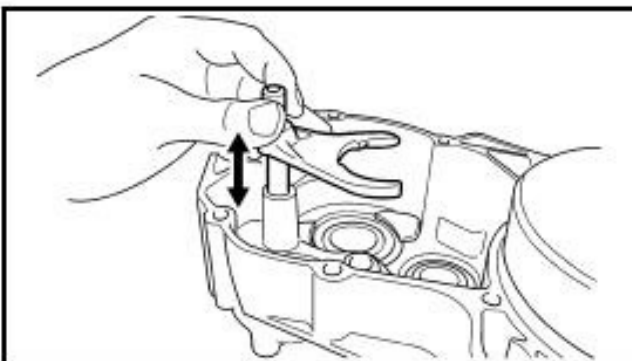
### 14.2.3 Shift fork, shift cam and segment



1. Inspect:
  - Shift fork ①  
Wear/damage/scratches → Replace.



2. Inspect:
  - Shift cam ①
  - Segment ②  
Wear/damage → Replace.



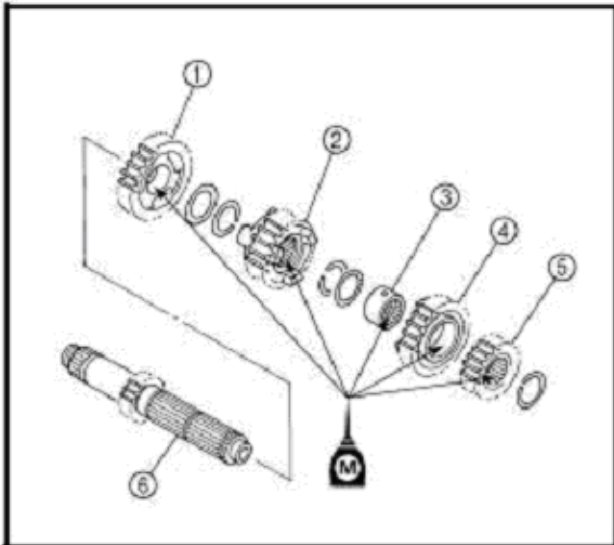
3. Check:
  - Shift fork movement  
Unsmooth operation → Replace shift fork.

**NOTE:** \_\_\_\_\_  
For a malfunctioning shift fork, replace not only the shift fork itself but the two gears each adjacent to the shift fork.  
\_\_\_\_\_



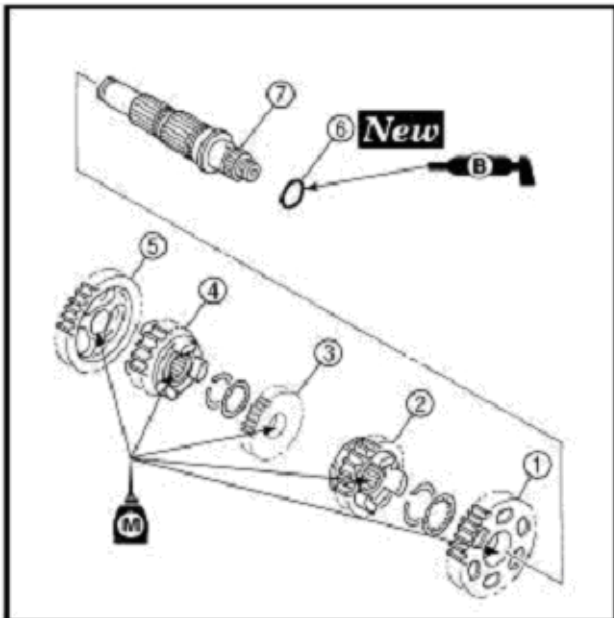
## 14.3 Assembly and installation

### 14.3.1 Transmission



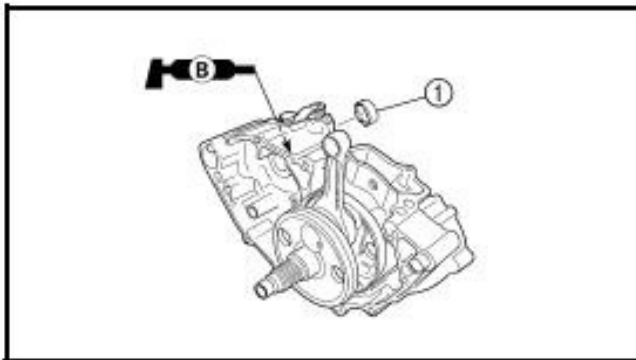
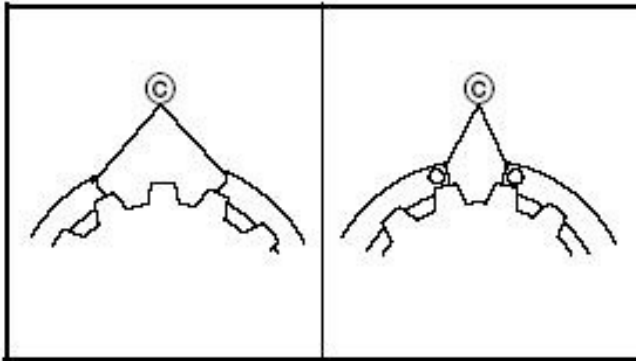
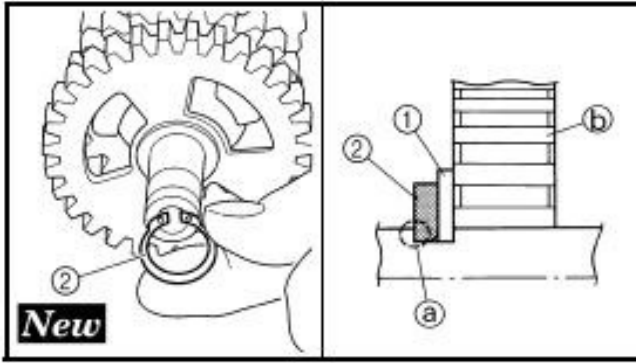
1. Install:
  - 5th pinion gear (29T) ①
  - 3rd pinion gear (15T) ②
  - Collar ③
  - 4th pinion gear (24T) ④
  - 2nd pinion gear (13T) ⑤
  - To main axle ⑥.

**NOTE:** \_\_\_\_\_  
 Apply the molybdenum disulfide oil on the inner and end surface of the idler gear and on the inner surface of the sliding gear, then install.  
 \_\_\_\_\_



2. Install:
  - 2nd wheel gear (26T) ①
  - 4th wheel gear (25T) ②
  - 3rd wheel gear (25T) ③
  - 5th wheel gear (20T) ④
  - 1st wheel gear (31T) ⑤
  - O-ring ⑥ **New**
  - To drive axle ⑦.

**NOTE:** \_\_\_\_\_  
 • Apply the molybdenum disulfide oil on the inner and end surface of the idler gear and on the inner surface of the sliding gear, then install.  
 • Apply the lithium soap base grease on the O-ring.  
 \_\_\_\_\_



3. Install:

- Washer ①
- Circlip ② **New**

NOTE:

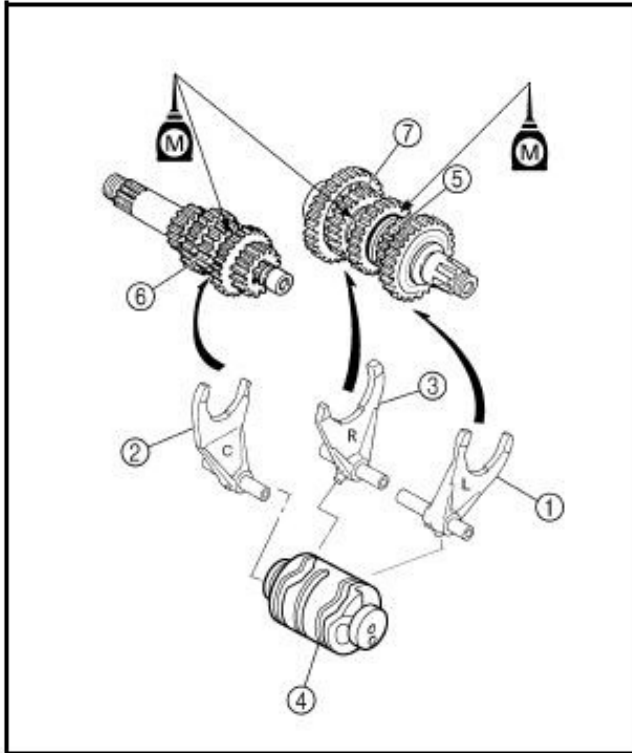
- Be sure the circlip sharp-edged corner (a) is positioned opposite side to the washer and gear (b).
- Install the circlip with its ends (c) settled evenly on the spline crests.

4. Install:

- Collar ①

NOTE:

- Apply the lithium soap base grease on the oil seal lip.
- When installing the collar into the crankcase, pay careful attention to the crankcase oil seal lip.



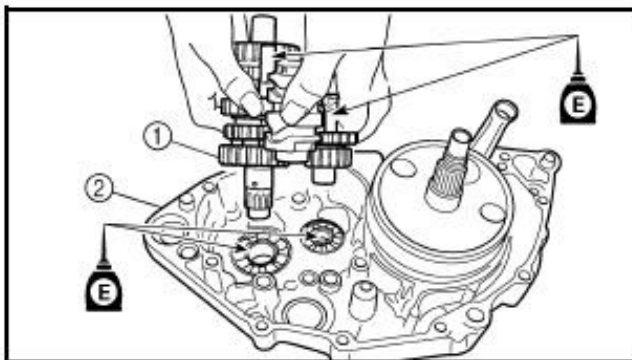
## 5. Install:

- Shift fork 1 (L) ①
- Shift fork 2 (C) ②
- Shift fork 3 (R) ③
- Shift cam ④

To main axle and drive axle.

**NOTE:**

- Apply the molybdenum disulfide oil on the shift fork grooves.
- Mesh the shift fork #1 (L) with the 4th wheel gear ⑤ and #3 (R) with the 5th wheel gear ⑦ on the drive axle.
- Mesh the shift fork #2 (C) with the 3rd pinion gear ⑥ on the main axle.

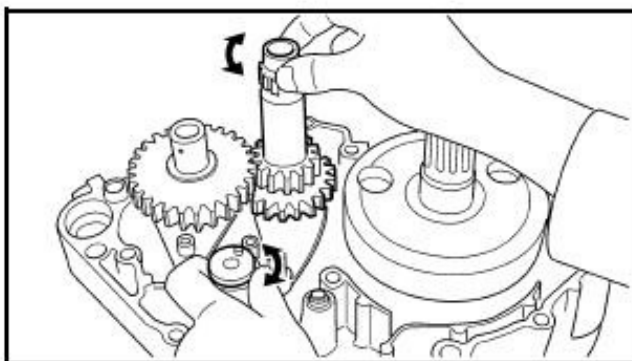


## 6. Install:

- Transmission assembly ①
- To left crankcase ②.

**NOTE:**

Apply the engine oil on the bearings and guide bars.

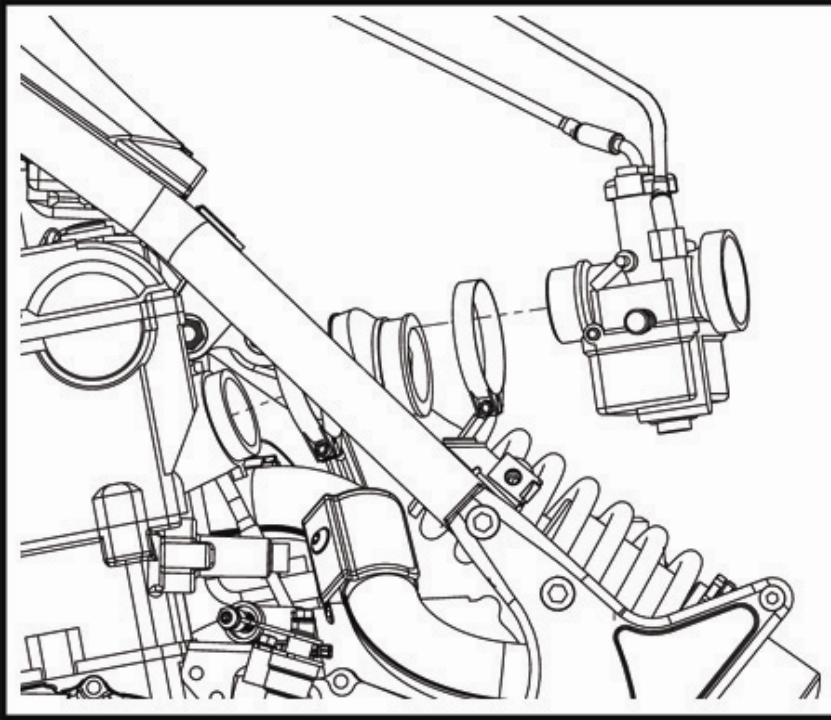


## 7. Check:

- Shifter operation
  - Transmission operation
- Unsmooth operation → Repair.



## 15 CARBURETTOR



### CARBURETTOR REMOVAL :

- Remove the fuel tank cover, the air cleaner case cover, the side covers and the rear fender (see "side covers removal").
- Remove the silencer (see "silencer removal").
- Remove the air cleaner case (see "air cleaner case removal").
- Unscrew carburettor fixing collar on the pipe.
- Remove the throttle cover and dismount the cable.
- Remove the choke cable in the command.
- Dismount the carburettor.
- Unscrew the pipe fixing collar on the engine.
- Dismount the pipe.

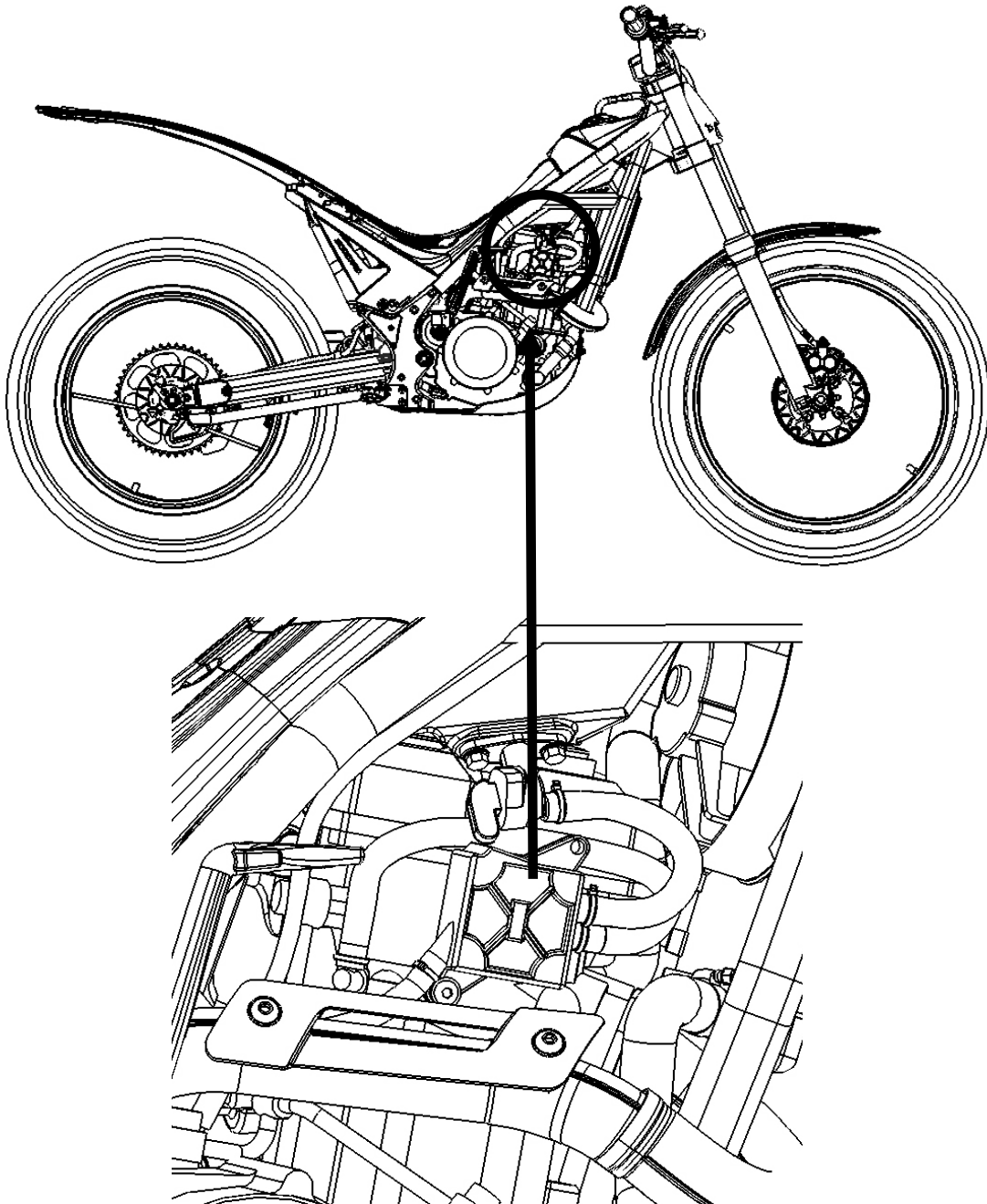
### CARBURETTOR INSTALLATION :

- Joint the pipe to the engine (check the alignment).
- Screw the pipe fixing collar on the carburettor.
- Joint the carburettor to the pipe.
- Screw the carburettor fixing collar on the pipe.
- Guide the cables to the handlebar.
- Install the choke cable on the command.
- Install the throttle cable on the command.
- Install the throttle cover.
- Install the air cleaner case (see "air cleaner case installation").
- Install the silencer (see "silencer installation").
- Install the rear fender, the side covers, the air cleaner case cover and the fuel tank cover (see "side covers installation").



## 16 FUEL PUMP

### Presentation



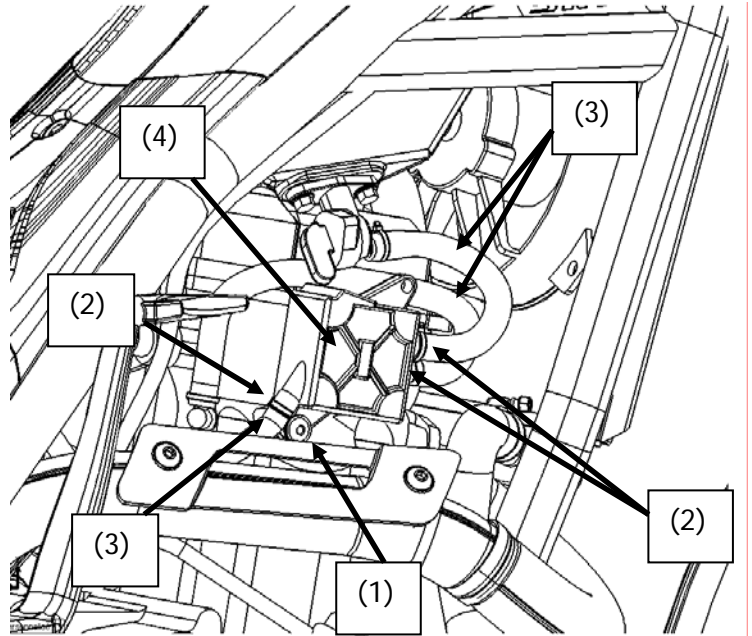


### Fuel pump removal:



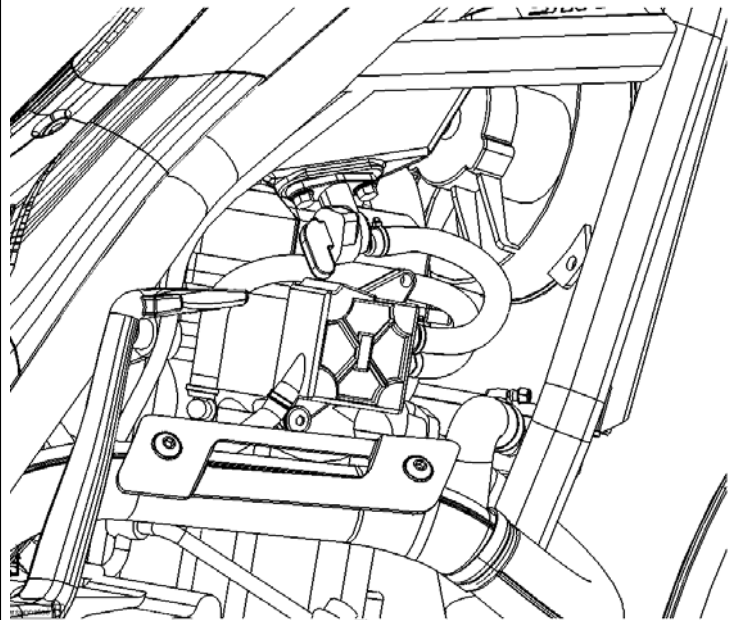
The hoses must be disconnected only after fuel pump bolt unscrewing. That can damage fuel pump fixing. Removal fuel pump before handling hoses.

- Close the fuel cock
- Unscrew BHCE M6 x 20 bolt which fixes the fuel pump (1)
- Remove the three fixing pump protection washers which are before and after the fuel pump fixing
- Cut the three locking collars which fix fuel hose to the fuel pump (2)
- Disconnect the three fuel pump hoses (3)
- Remove the pump (4)



### Fuel pump installation:

- Present the fuel pump
- Connect the three fuel hoses to the fuel pump
- Put the three fixing pump protection washers :
  - Two washers between the head cylinder and the fuel pump
  - One between the fuel pump and the bolt
- Screw BHCE M6 x 20 bolt
- Put three locking collars to ensure fuel hoses to the fuel pump





CHASSIS





## 1 Glossary



Lubricate with grease.



Lubricate with copper grease.



Use hard locking agent.



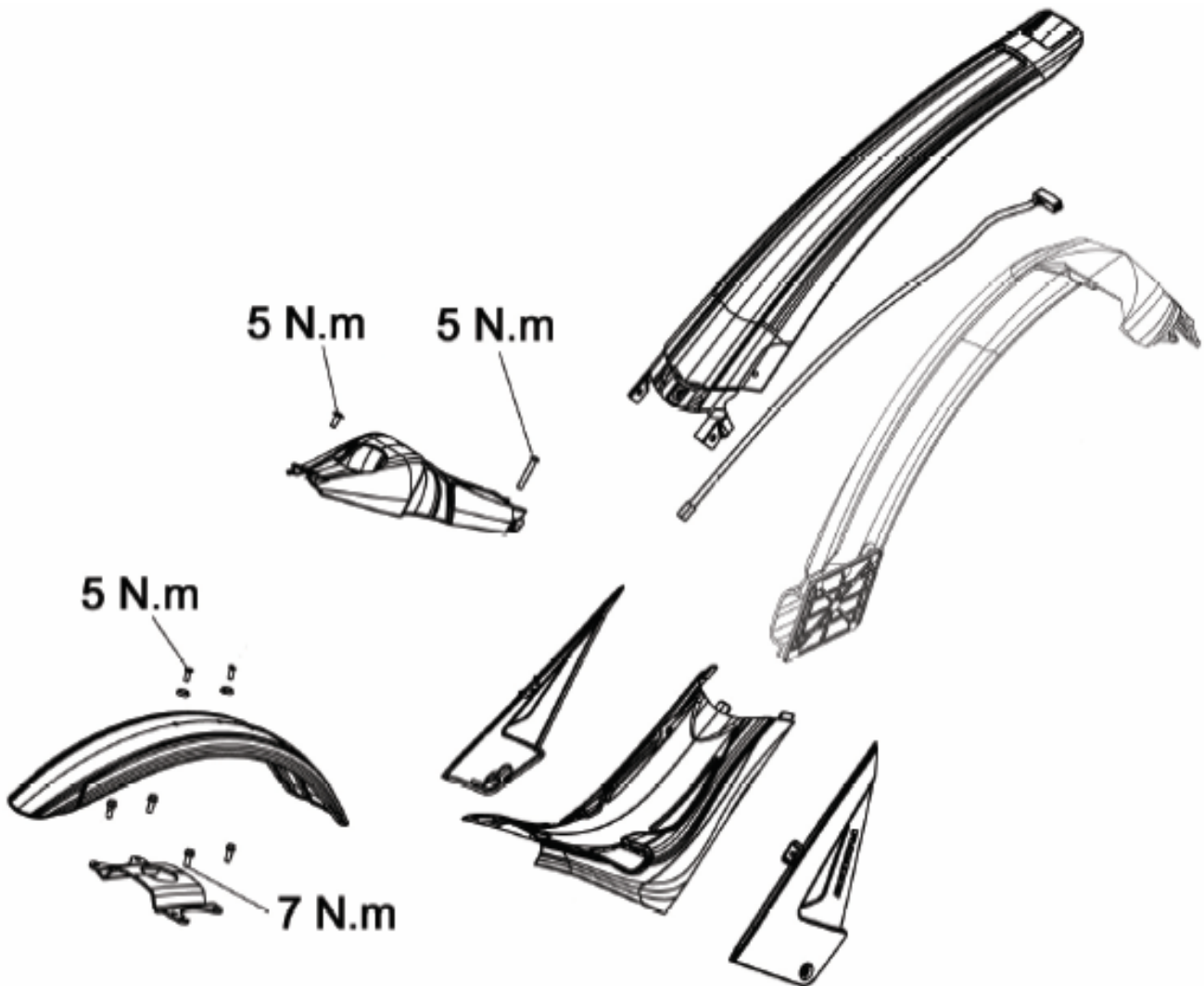
Use soft locking agent.

6 N.m

Tightening torque.



## 2 Plastics :



### 2.1 Side covers removal :

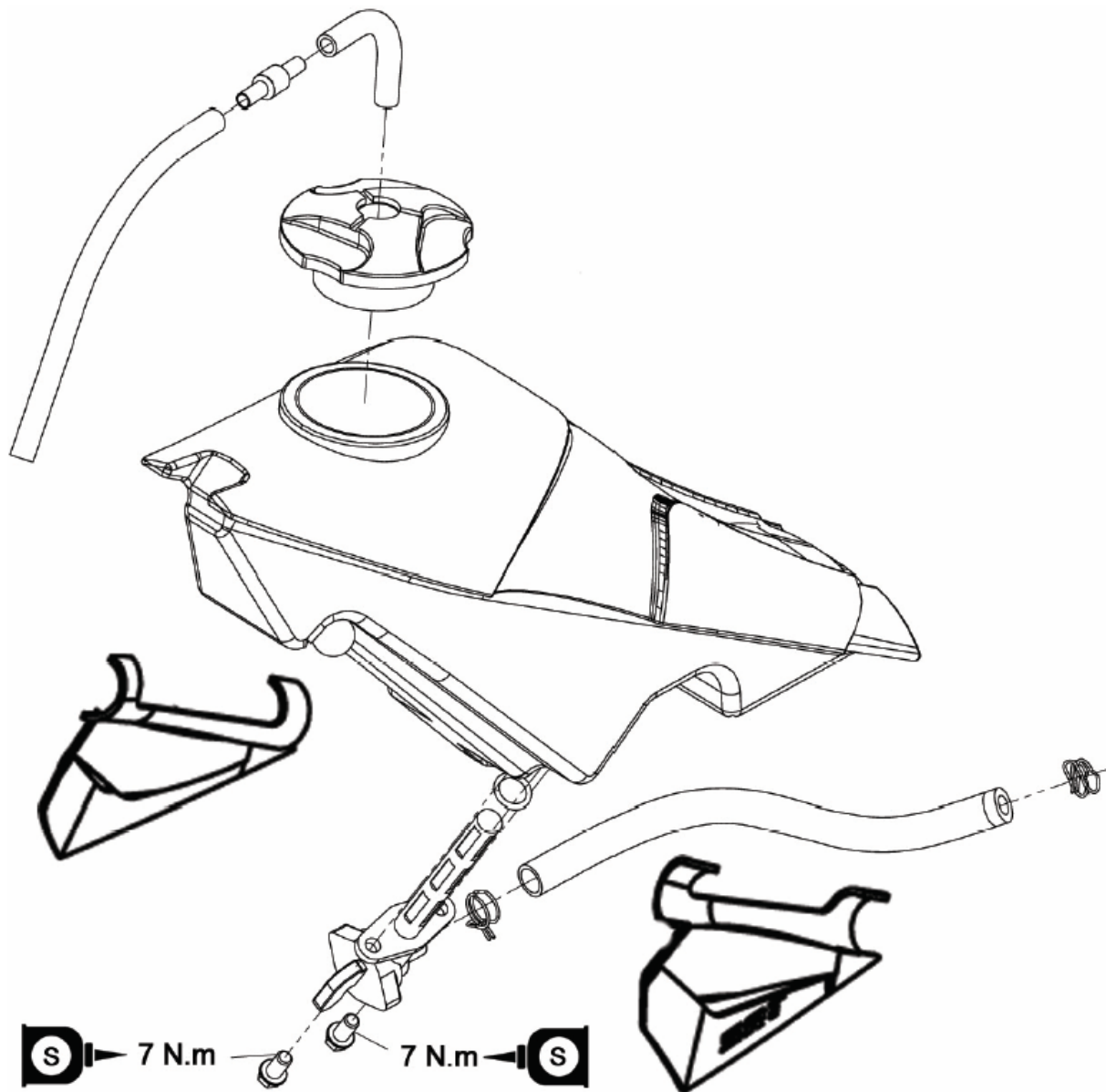
- Unscrew the fuel tank cover upper bolt.
- Remove the cover.
- Unscrew the air cleaner case cover bolt.
- Remove the cover.
- Unscrew the 3 rear fender bolts.
- Remove the rear fender.
- Unplug the electric cables.
- For each side, unscrew the 2 silencer side covers bolts.
- Remove the silencers side covers.
- Unscrew the 4 license plate support bolts and remove it.

### 2.2 Side covers installations :

- Install the silencer side covers.
- For each side, screw the 2 silencer side covers bolts.
- Install the rear fender.
- Plug the electric cables.
- Screw the 3 rear fender bolts, putting the heat-protecting washers.
- Install the air cleaner case cover.
- Screw the air cleaner case cover bolt.
- Install the license plate support and screw the 4 fixing bolts.
- Install the tank cover.
- Screw the fuel tank cover upper bolt.



### 3 Fuel tank :



#### 3.1 Fuel tank and side covers removal :

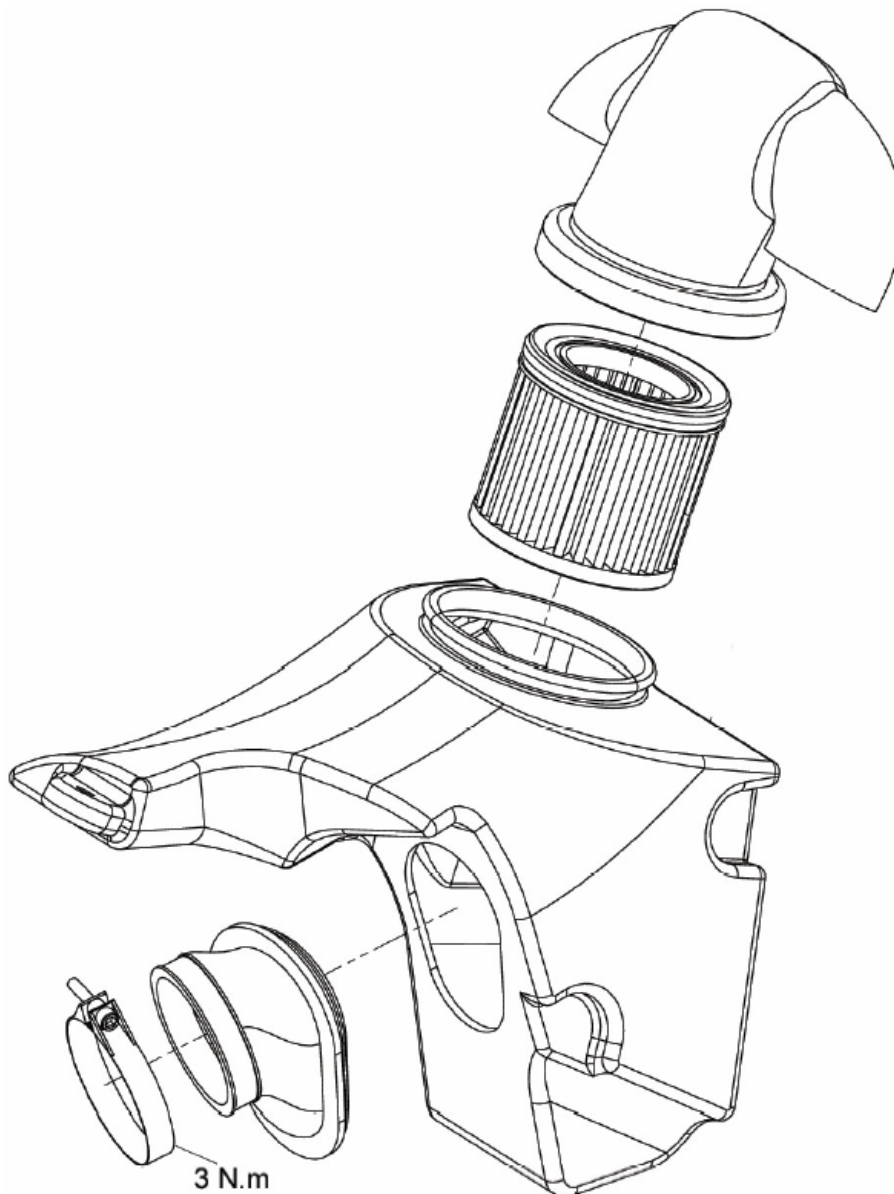
- Remove the fuel tank cover (see "side cover removal")
- Remove the fuel tank, dismounting the fuel hose clip and disconnecting the hose (warning, the cock position must be on "OFF")
- Remove the side covers.
- Drain the fuel tank on the position "RES" (never throw out the fuel in the nature).
- Unscrew the cover bolts.

#### 3.2 Fuel tank and side covers installation :

- Install the cock with a new seal.
- Screw the 2 cock bolts.
- Install the side covers.
- Install the fuel tank, connecting the fuel hose with the clip.
- Install the tank cover (see "side covers installation").



## 4 Air cleaner case :



### 4.1 Air cleaner case removal :

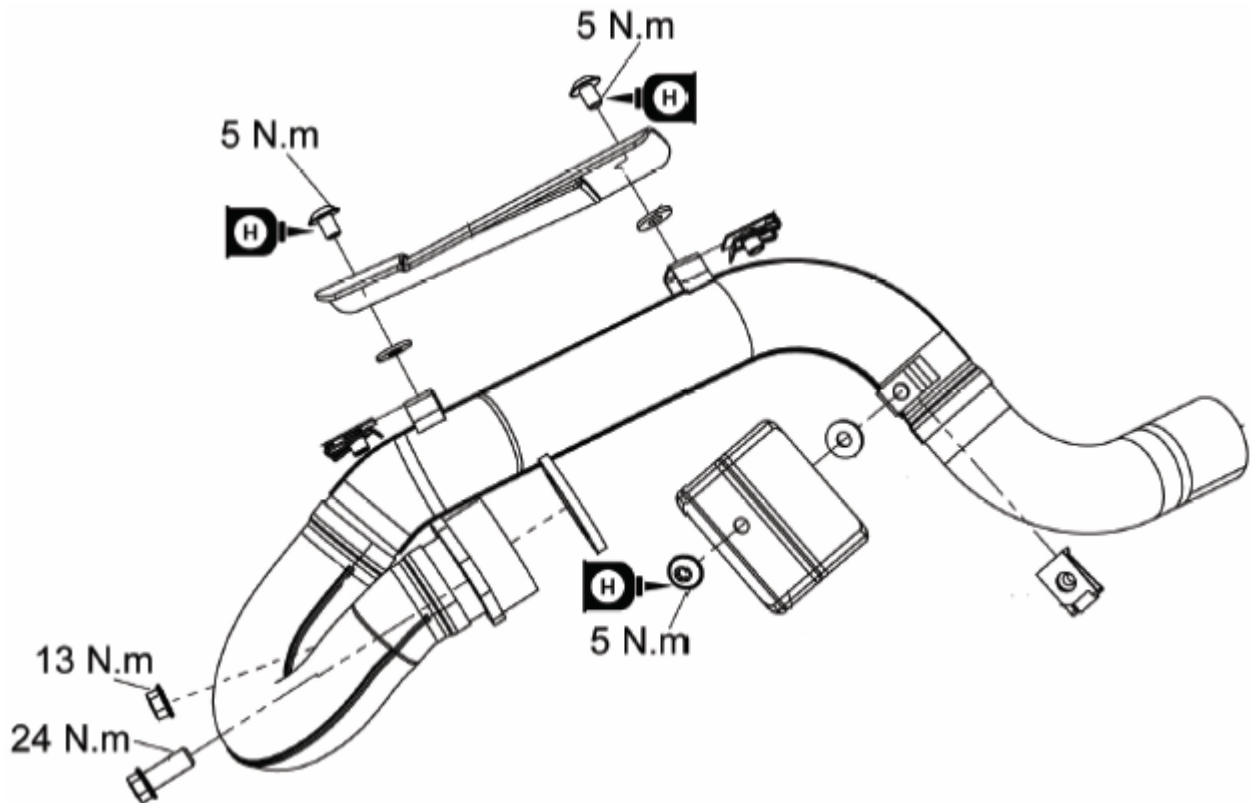
- Remove the fuel tank cover, the air cleaner case, the side covers and the rear fender (see "side cover removal").
- Remove the silencer (see « silencer removal »).
- Unscrew the air cleaner sleeve collar.
- Remove the air cleaner case.
- Remove the air cleaner cap by pulling it.
- Remove the air cleaner filter.

### 4.2 Air cleaner case installation :

- Install the air cleaner filter.
- Install the air cleaner cap.
- Join the air cleaner sleeve to the carburettor.
- Screw the collar.
- Install the silencer (see "silencer installation").
- Install the rear fender, the air cleaner case, the side covers and the fuel tank cover (see "side cover removal").



## 5 Exhaust pipe :



### 5.1 Exhaust pipe removal :

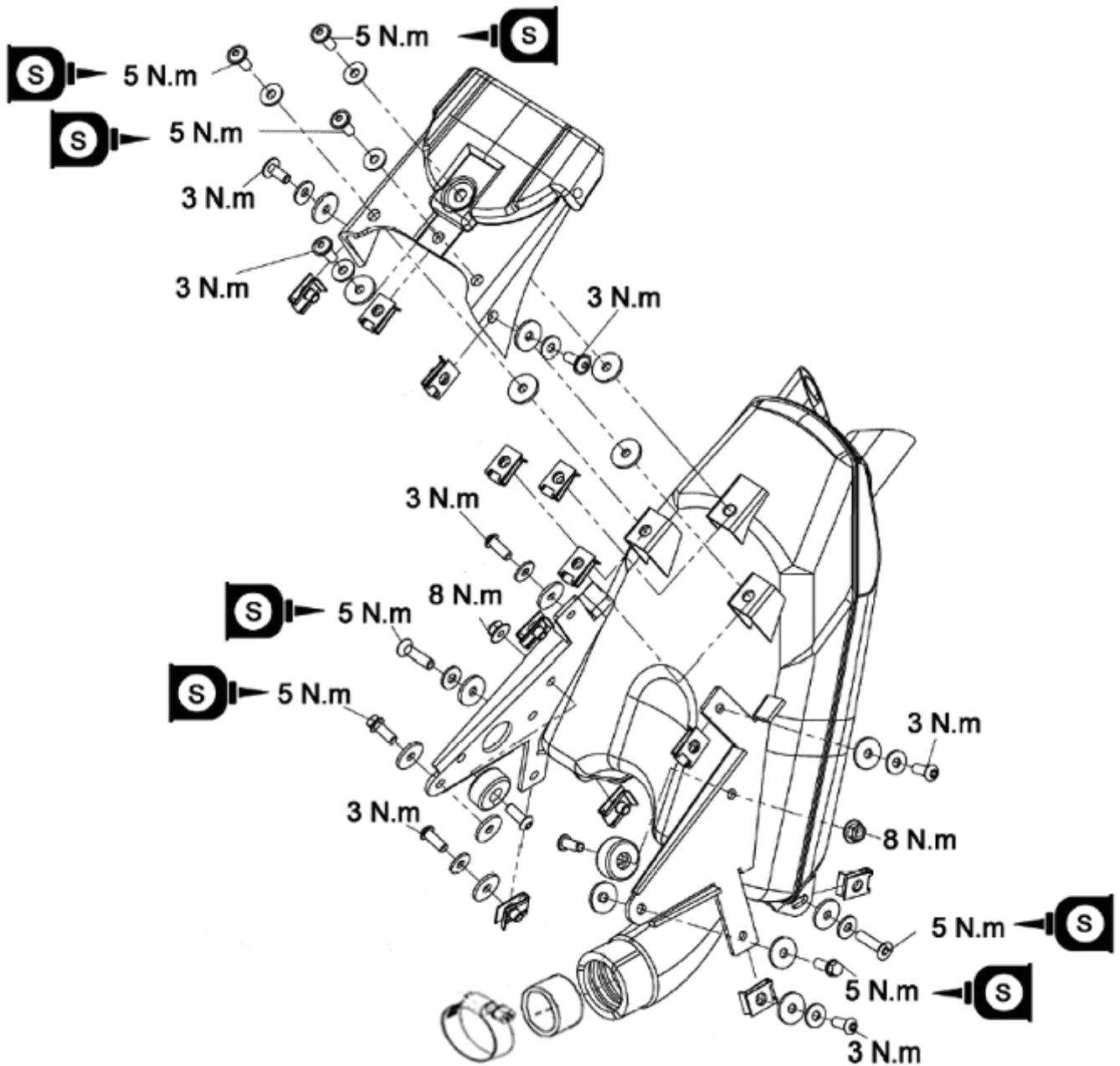
- Remove the air cleaner case (see « air cleaner case removal »).
- Remove the carburettor (see « carburettor removal »)
- Unscrew the exhaust pipe fixing nut and bolt.
- Remove the exhaust pipe.

### 5.2 Exhaust pipe installation :

- Place the exhaust pipe (put a new seal).
- Screw the exhaust pipe fixing nut and bolt.
- Install the carburettor (see "carburettor installation").
- Install the air cleaner case (see "air cleaner case installation").



## 6 Muffler :



### 6.1 Muffler removal :

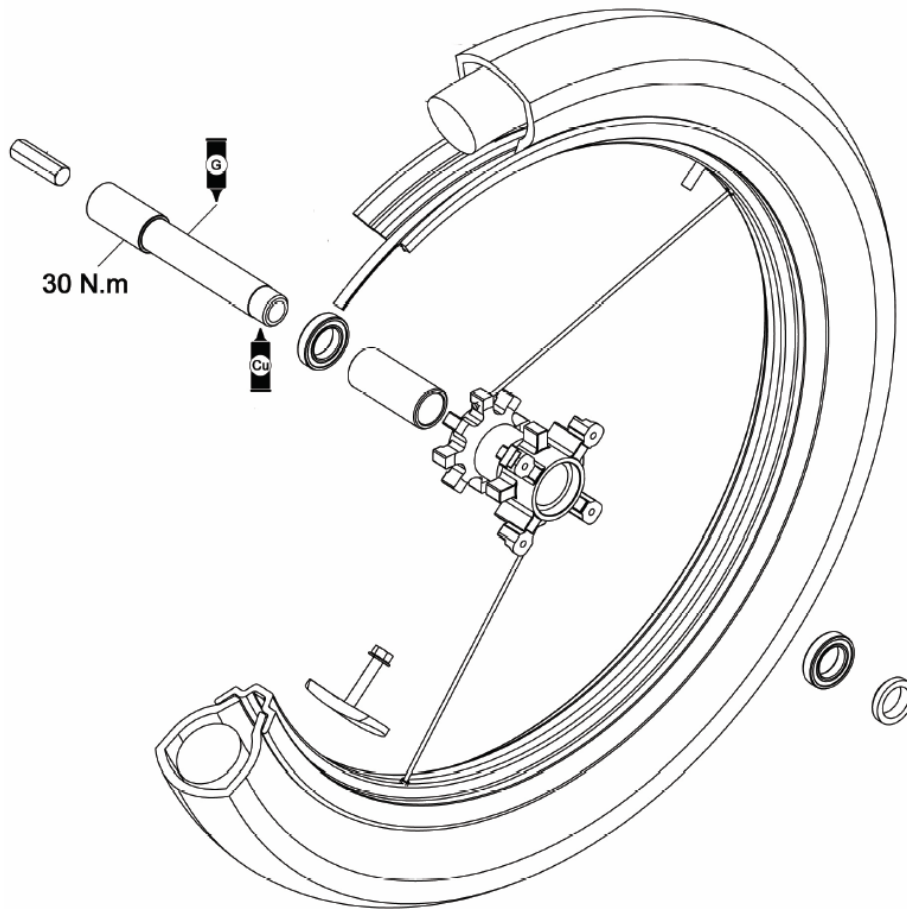
- Remove the fuel tank cover, the air cleaner case cover, the side covers and the rear fender (see "side cover removal").
- Unscrew the 4 bolts fixing the silencer to the frame.
- Remove the silencer of the exhaust pipe.

### 6.2 Muffler installation :

- Lubricate the graphite seals.
- Joint the silencer to the exhaust pipe.
- Screw the 4 bolts fixing the silencer to the frame.
- Install the rear fender, the air cleaner case cover, the side covers and the fuel tank cover. (see "side cover installation").



## 7 Front wheel :



### 7.1 Front wheel removal :

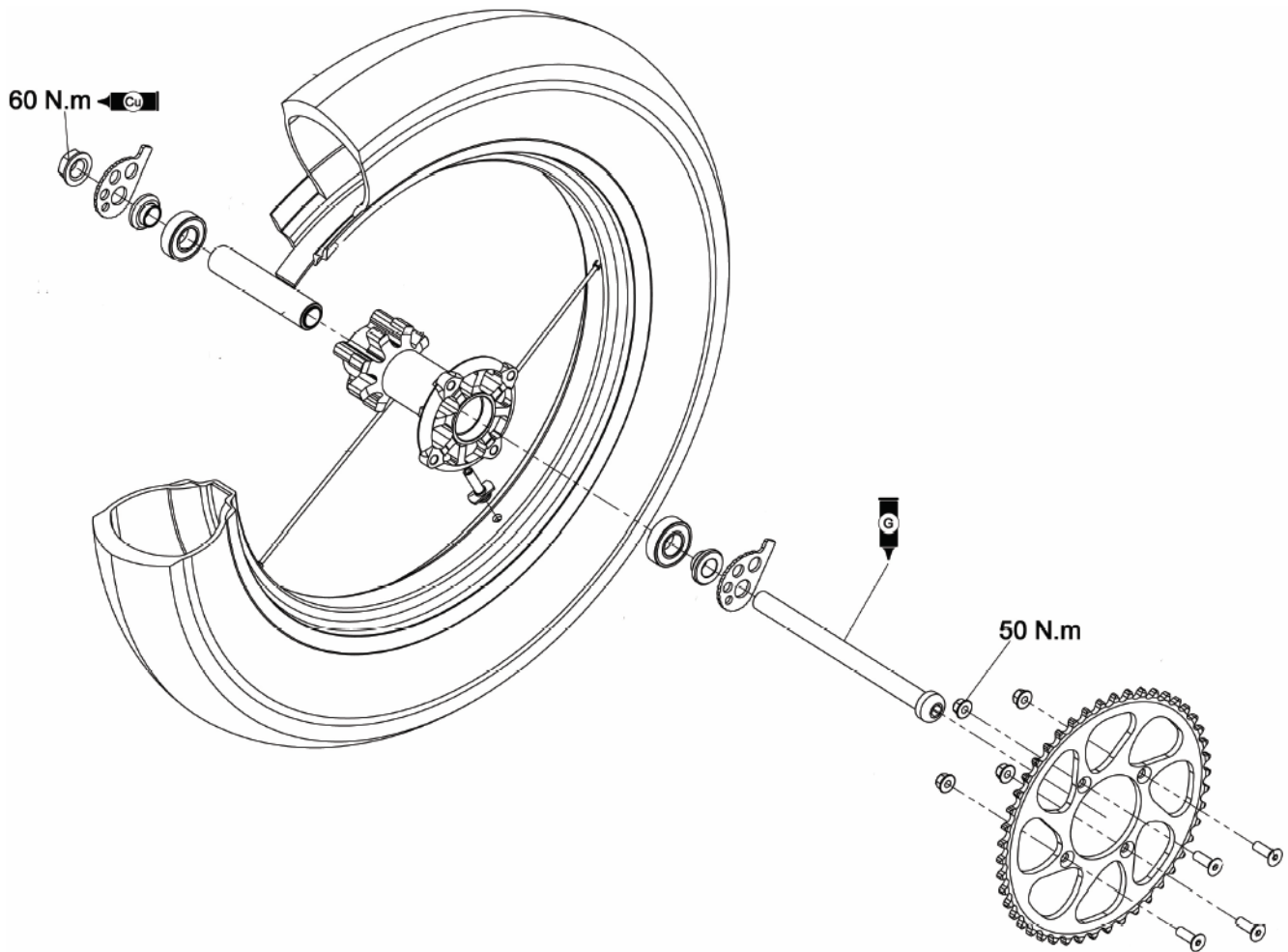
- Unscrew the 3 bottom fork axle bolts.
- Unscrew the axle with hexagonal tool.
- Remove the axle.
- Remove the front wheel.
- Warning : don't use the brake without the wheel (put a key between the pads).

### 7.2 Front wheel installation :

- Lubricate the front wheel axle and lubricate the threading with copper grease.
- Place the front wheel (with the disc between the pad kit) and install the axle, with the spacer (at the calliper side).
- Screw the axle.
- Unscrew (partly) the 2 bolts at the right side of the front fender bracket.
- Lock the front brake and push down on the handlebar several times.
- Screw the bottom fork bolts.
- Screw the fender bracket bolts.



## 8 Rear wheel :



### 8.1 Rear wheel removal :

- Unscrew the rear wheel nut.
- Remove the right eccentric.
- Remove the rear wheel axle.
- Remove the rear wheel.
- Warning : don't operate the brake without the wheel (put a key between the pads).

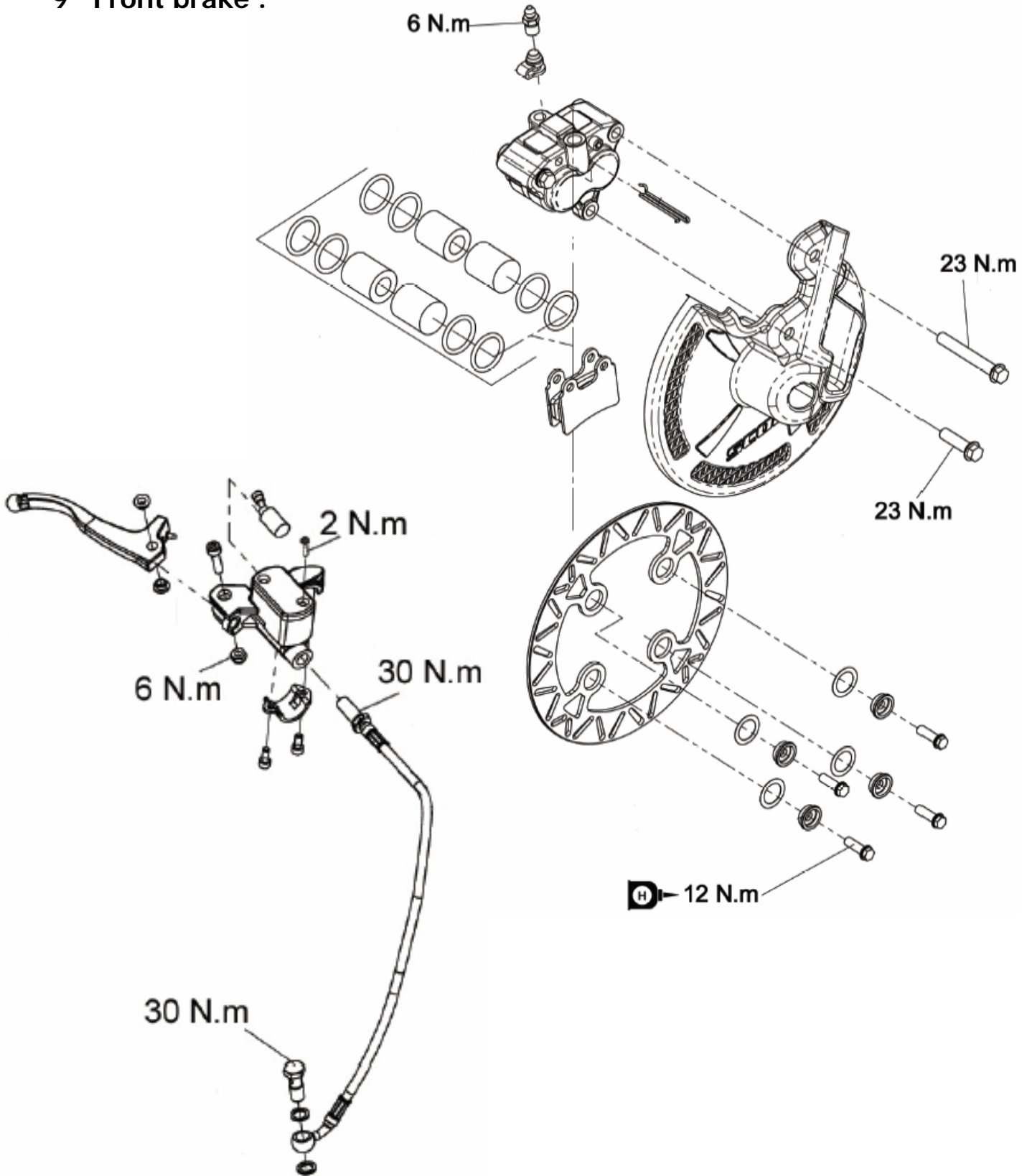
### 8.2 Rear wheel installation :

- Place the rear wheel (and the chain).
- Install the left eccentric on the axle.
- Lubricate the axle.
- Install the axle.
- Install the right eccentric.
- Lubricate the axle nut threading with copper grease.
- Adjust the drive chain slack.
- Screw the rear wheel nut.





9 Front brake :





### 9.1 Front brake control removal :

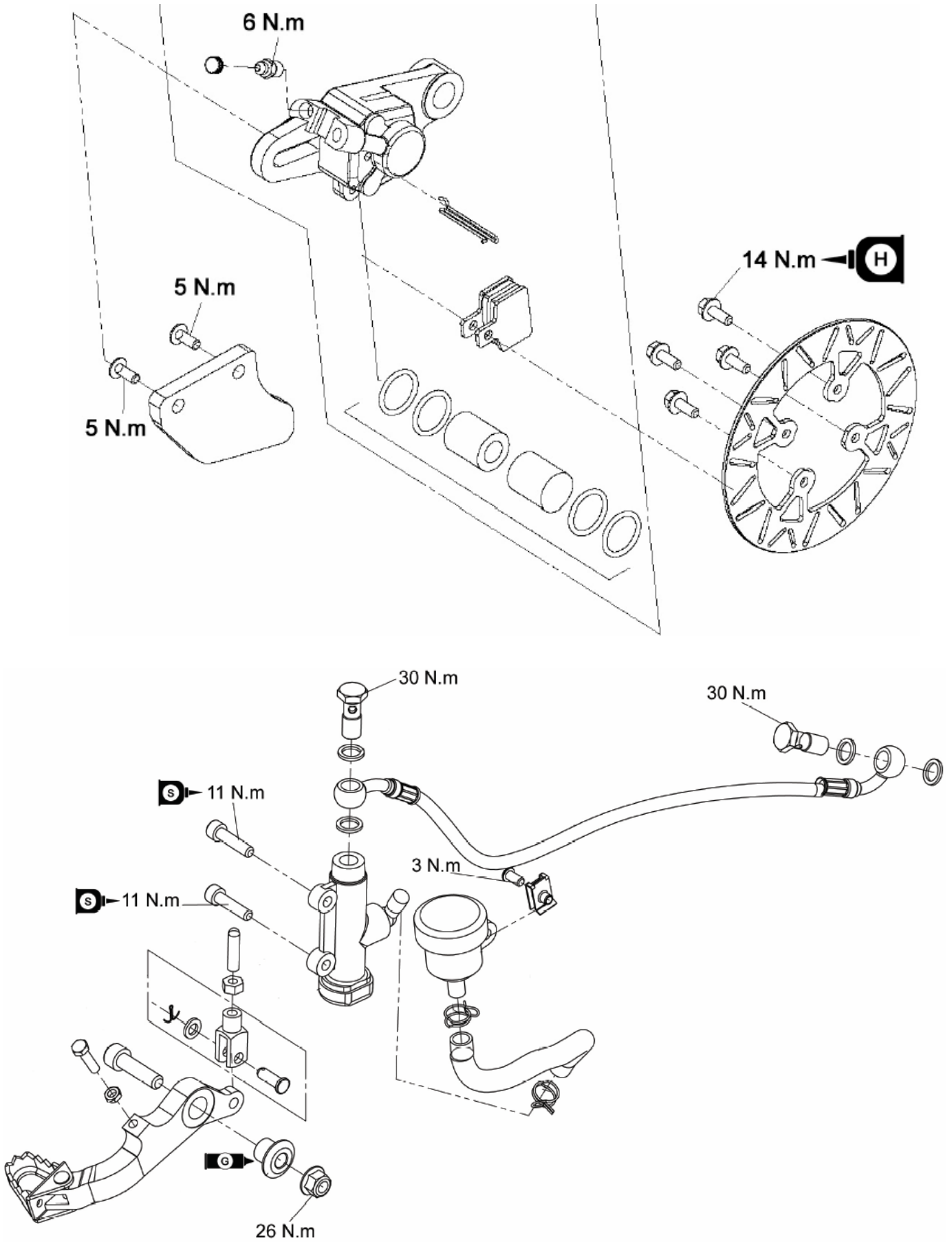
- Unscrew the two front brake calliper.
- To take out the disc : remove the front wheel (see "front wheel removal") then unscrew the 4 disc fixing bolts.
- To remove the pad kit : unscrew the bolt and remove the lock pin.
- To remove the master cylinder cover : unscrew the 2 cover bolts (warning : this task must be done the master cylinder fixed to the handlebar, and the bike stable and straight).
- To remove the master cylinder from the handlebar : unscrew the 2 master cylinder bracket bolts.
- To remove the lever : unscrew the nut then unscrew the bolt and finally remove the lever (be careful to the spacers).
- To remove the hose, unscrew the pipe portion bolt, near the slave cylinder then near the master cylinder (warning : the liquid is corrosive for the painting and dangerous for the body).

### 9.2 Front brake control installation :

- To install the hose : screw the pipe portion bolt to the master cylinder after changing the washer seals, then screw the pipe portion bolt the slave cylinder after changing the washer seals.
- To install the lever : put the 2 spacers then screw the bolt after positioning the lever and finally, screw the nut.
- To install the master cylinder cover : screw the 2 cover bolts.
- To install the master cylinder on the handlebar : install the bracket and screw the 2 fixing bolts.
- To install the disc : put the 4 washers and the 4 spacers then screw the 4 bolts with hard locking agent, and finally install the front wheel (see "front wheel installation").
- Install the calliper and the front disc protective plate then screw the 2 calliper fixing bolts.
- Warning : if the hose has been removed, you must air bleed the front brake control.



10 Rear brake :





### 10.1 Rear brake control removal :

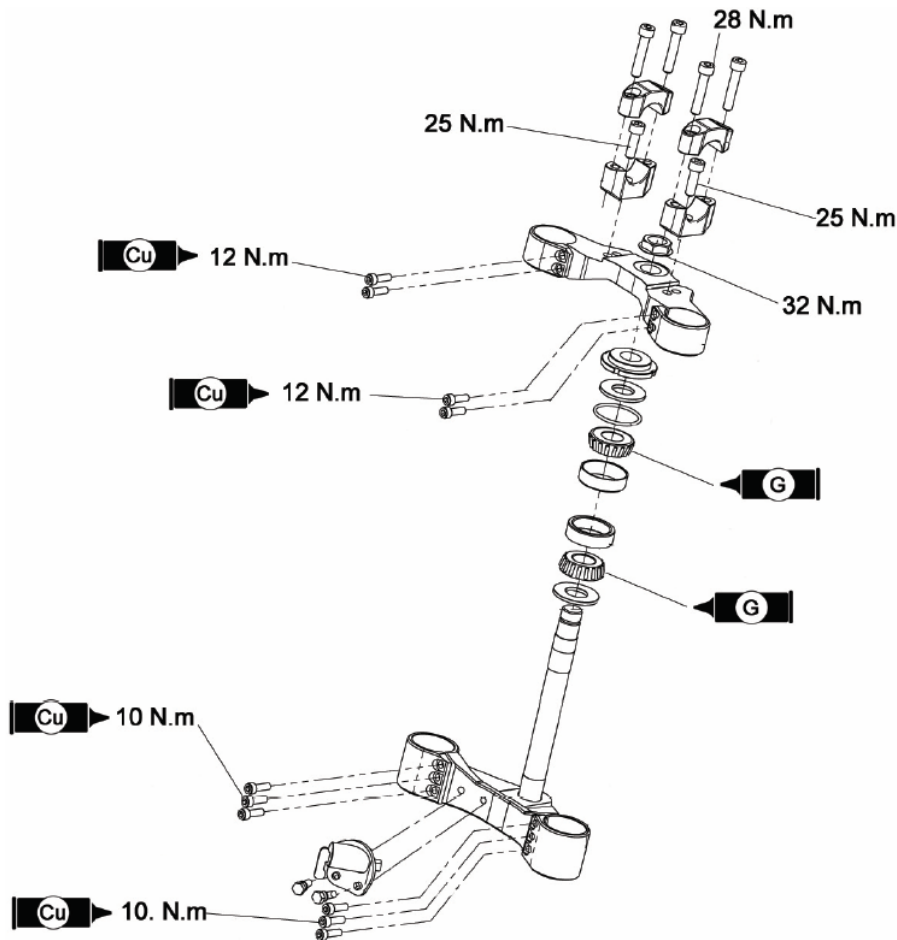
- Remove the rear wheel (see "rear wheel removal").
- Remove the rear brake calliper.
- Unscrew the rear brake pedal bolt.
- Take out the bolt and remove the pedal.
- Unscrew the liquid container screw.
- Warning : the liquid container must be kept with the cap upwards to avoid the air bleed.
- Unscrew the 2 rear brake master cylinder fixing bolts and remove it.
- To remove the brake hose : unscrew the master cylinder fixing hose fixing bolt then unscrew the slave cylinder hose fixing bolt (Warning : the liquid is corrosive for the painting and dangerous for the body).

### 10.2 Rear brake control installation :

- To install the hose : screw the pipe portion bolt to the master cylinder after changing the washer seals, then screw the pipe portion bolt the slave cylinder after changing the washer seals.
- Install the rear master cylinder and the 2 fixing bolts.
- Install the liquid container then screw the two fixing bolts.
- Lubricate the brake pedal spacer.
- Install the brake pedal and install the fixing bolt.
- Screw the pedal axle nut.
- Install the rear brake calliper.
- Install the rear wheel (see "rear wheel installation").
- Warning : if the hose has been removed, you must air bleed the front brake control.



## 11 Steering :



### 11.1 Handle crowns removal :

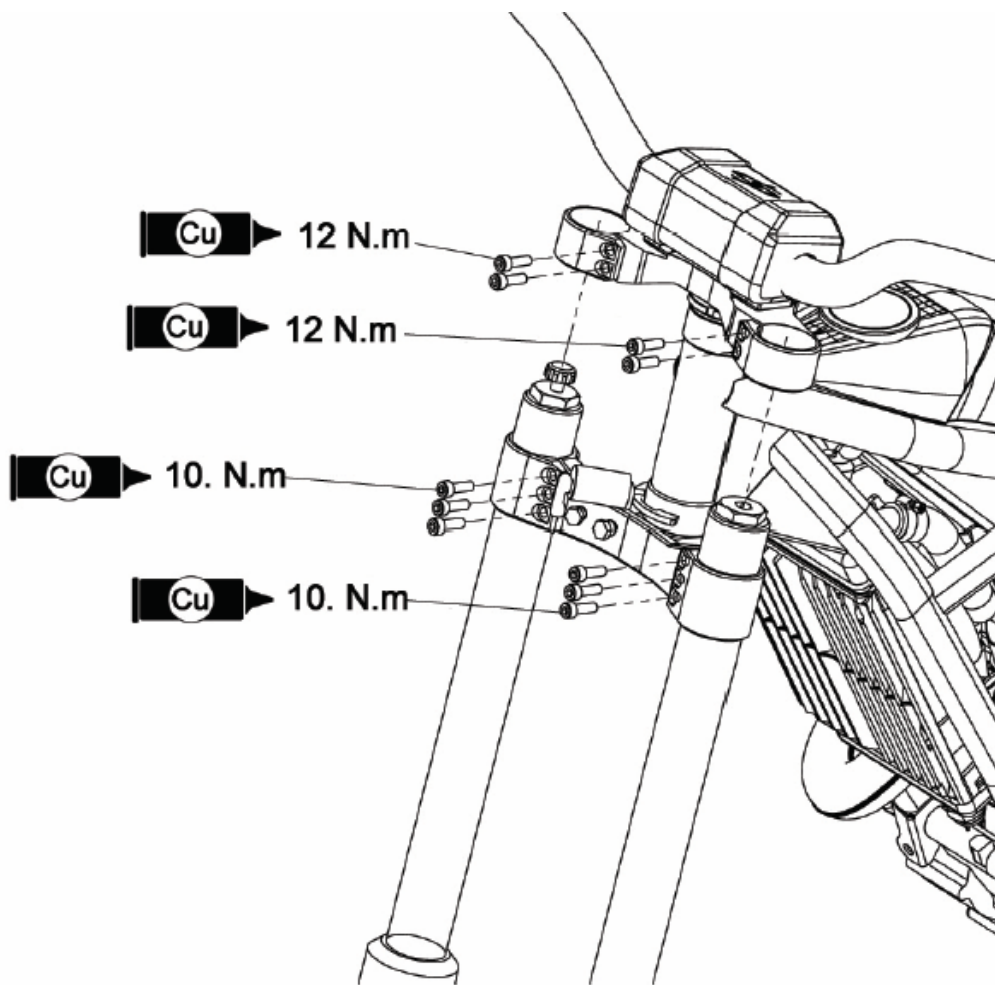
- Remove the fork (see « fork removal »).
- Unscrew the 4 handle upper holders fixing bolts and remove the holders.
- Remove the handlebar.
- Unscrew the 2 handle lower holders fixing bolts and remove the holders.
- Unscrew the front fork cap nut.
- Remove the upper handle crown.
- Unscrew the upper bearing support nut.
- Remove the washer, the o'ring and the bearing.
- Remove the lower handle crown.

### 11.2 Handle crowns installation :

- Lubricate the lower steering bearing.
- Install the upper handle crown in the steering.
- Lubricate and install the upper steering bearing.
- Install the o'ring.
- Install the washer then screw the upper bearing support nut with the steering nut wrench (screw to eliminate the play, make sure there are no hard points in the steering).
- Install the upper handle crown and screw the front fork cap nut.
- Install the lower handle holders and screw the 2 fixing bolts.
- Install the handle bar.
- Install the upper handle holders and screw the 4 fixing bolts.
- Install the fork (see "fork installation").



## 12 Fork :



### 12.1 Fork removal :

- Remove the front wheel (see « front wheel removal »).
- Unscrew the 2 front calliper fixing bolts and remove the calliper.
- Unscrew the 2 front fender fixing bolts and remove the fender.
- Unscrew the 4 front fender bracket fixing bolts and remove the bracket.
- Unscrew the 2 upper crown bolts.
- Unscrew the 3 lower crown bolts (warning : the inner tube will fall).
- Repeat this work for the second inner tube.

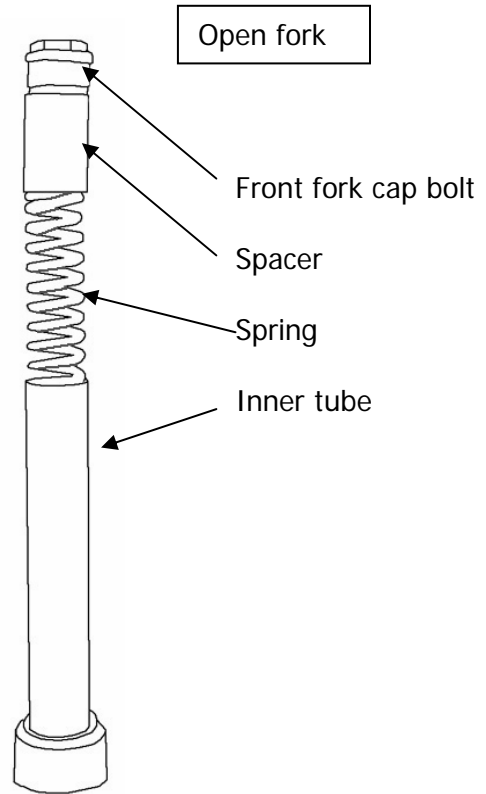
### 12.2 Fork installation :

- Install correctly the inner tube (the upper line should be just visible at the top of the upper crown).
- Screw temporarily the lower crown bolts.
- Screw the upper crown bolts (lubricated with copper grease).
- Screw the lower crown bolts (lubricated with copper grease).
- Repeat the work for the other inner tube.
- Install the front fender bracket and screw the 4 fixing bolts.
- Install the front fender and screw the 2 fixing bolts (don't forget the plastic washers).
- Install the front brake calliper and the holder, then screw the 2 fixing bolts.
- Install the front wheel (see "front wheel installation").

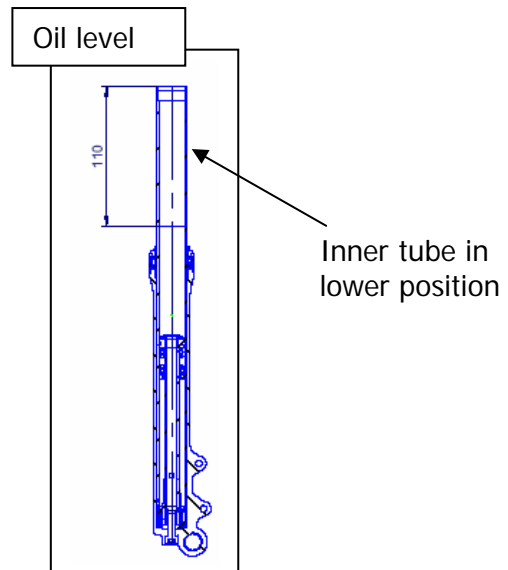
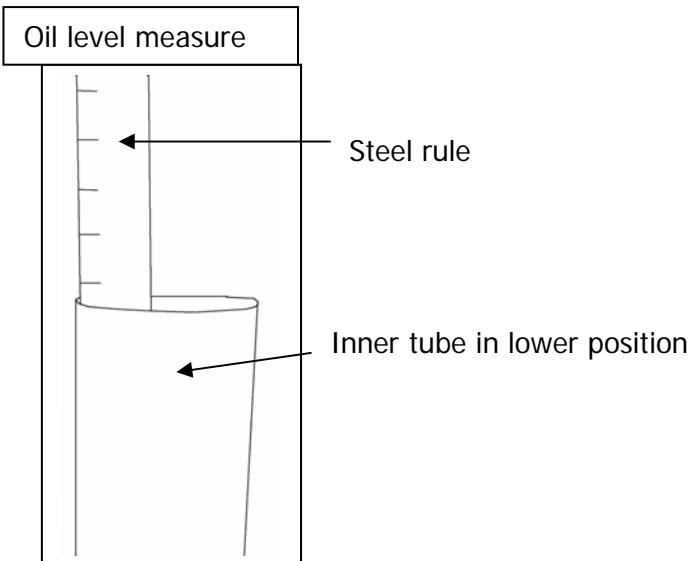
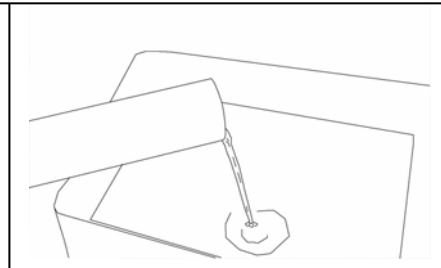


**12.3 Oil change, fork of left side**

- Remove the front fork cap bolt
- Leave spacer and spring
- Return the fork to empty oil.
- For completely empty oil of the fork, move several time inner tube and damper rod
- When oil is completely evacuate, return the fork and add some ml of new oil for rinse the interior of fork .
- Repeat operation 3 and 4
- Return fork in the good feel and fill it with oil, MOTUL Fork Oil Light 5W.
- Pump several time to distribute oil fork.
- The oil quantity is good then the level of oil is 110 mm (4.33 in) with inner tube and damper rod in lower position.
- Pump several time (inner tube and damper rod) and check the level. If the level isn't constant, supplement .
- Install the spring and the spacer (metal ring in contact with spring)
- Remove Front fork cap bolt and tighten it (20Nm ; 15lbf.ft)



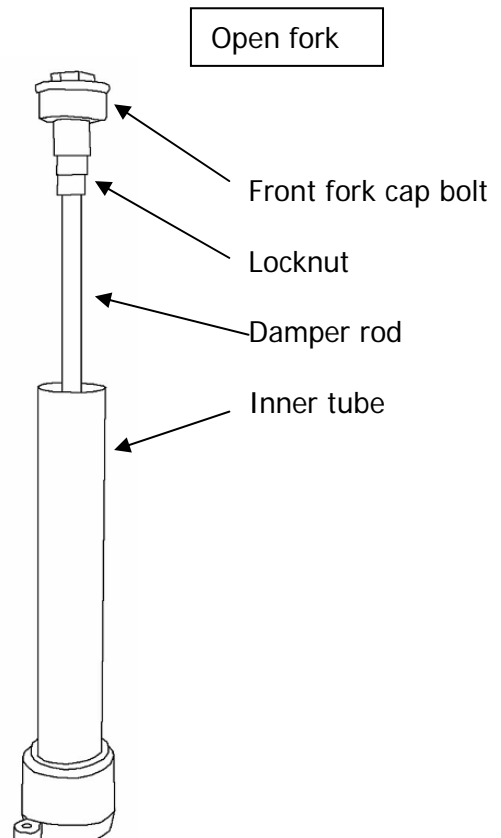
Recover oil and deposit it in the places envisaged for this purposes (dechetery,...).



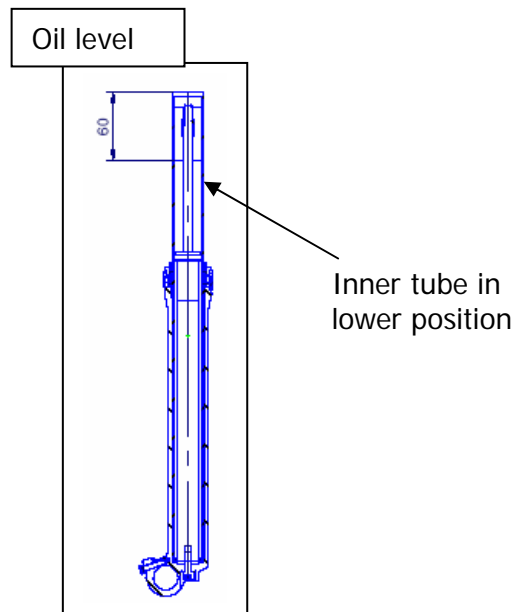
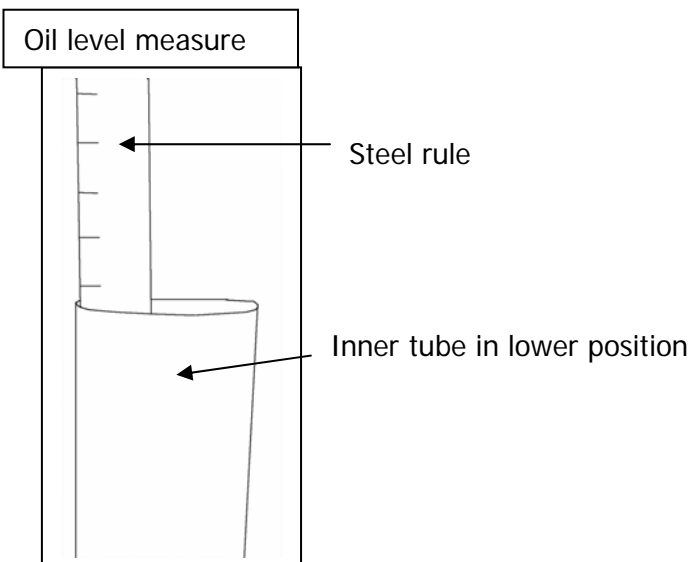
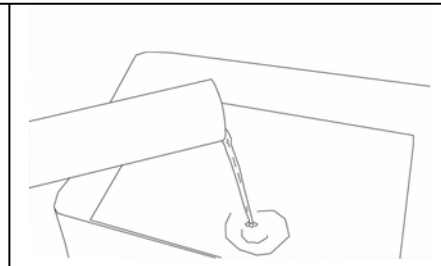


**12.4 Oil change, fork of right side**

- Remove the front fork cap bolt
- Loosen the locknut and remove the front fork cap bolt.
- Return the fork to empty oil.
- For completely empty oil of the fork, move several time inner tube and damper rod
- When oil is completely evacuate, return the fork and add some ml of new oil for rinse the interior of fork .
- Repeat operation 3 and 4
- Return fork in the good feel and fill it with oil, MOTUL Fork Oil Light 5W.
- Pump several time to distribute oil fork.
- The oil quantity is good then the level of oil is 60 mm (2.36in) with inner tube and damper rod in lower position.
- Pump several time (inner tube and damper rod) and check the level. If the level isn't constant, supplement .
- Install the front fork cap bolt, the locknut doesn't block cap bolt.
- Tighten the cap bolt, block it with the locknut
- For closed fork, put the inner tube in is upper position and tighten the cap bolt (20Nm ; 15lbf.ft)



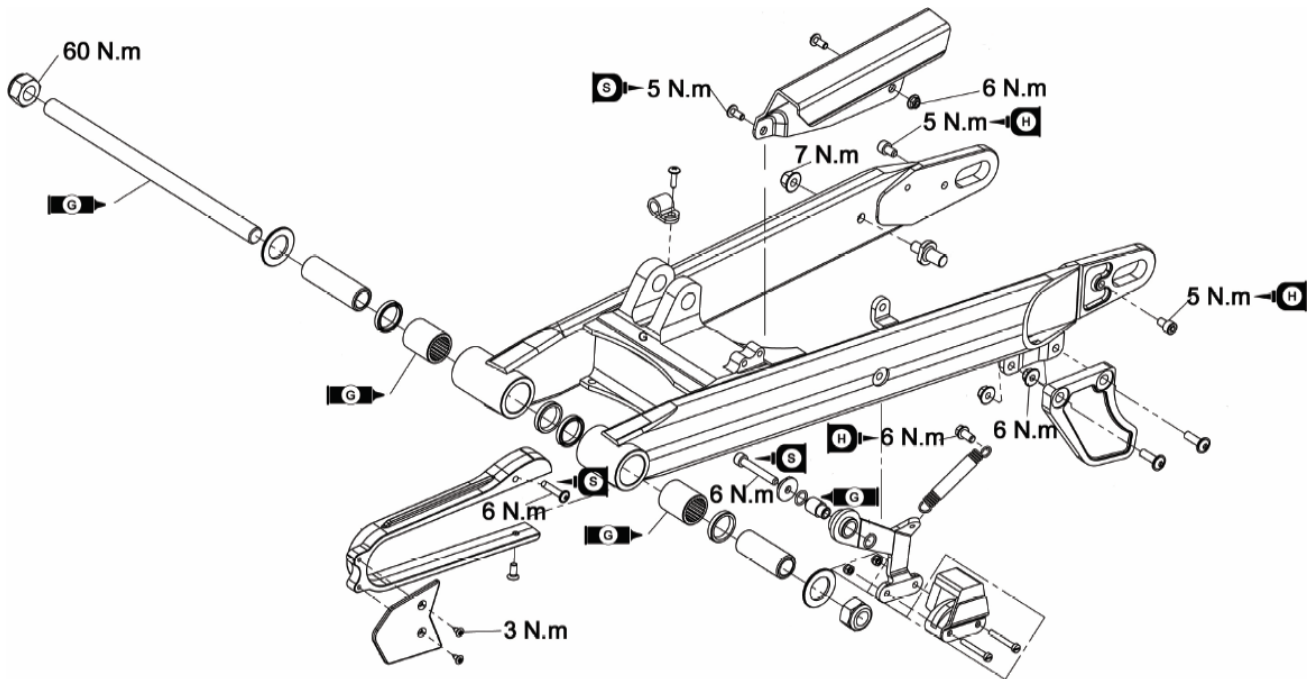
Recover oil and deposit it in the places envisaged for this purposes (dechetry,...).







## 13 Swing arm :



### 13.1 Swing arm removal :

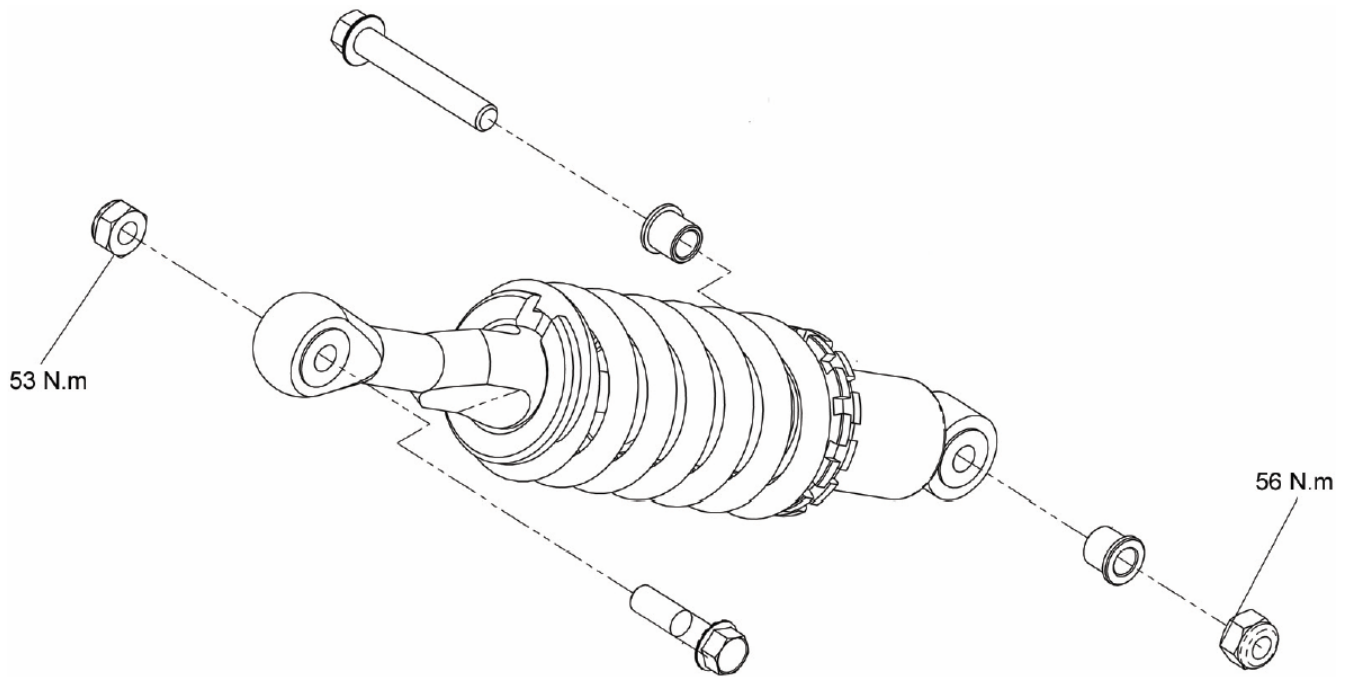
- Remove the rear wheel (see « rear wheel removal »).
- Remove the license plate support (see "side covers removal").
- Remove the quick disconnect fastener.
- Unscrew the brake hose holder bolt.
- Unscrew the swing arm axle and remove it.
- Remove the swing arm.
- Unscrew the sprocket drive cover bolts.
- Unscrew the chain guard bolts and remove the chain guard.
- Unscrew the chain puller fixing bolts.
- Unscrew the chain puller spring bolts, remove the chain puller spring.
- Unscrew the eccentric stop bolt.
- Unscrew the driven sprocket protective plate nuts.
- Remove the protective plate bolts then remove the protective plate.
- Unscrew the rear brake calliper stop.
- Unscrew the chain cover fixing bolt and nut, remove the bolt then remove the chain cover.

### 13.2 Swing arm installation :

- Install the chain cover and the fixing bolts.
- Screw the chain cover nut and bold (use soft locking agent on the bolt).
- Screw the rear brake calliper stop and the nut.
- Install the protective plate with the fixing bolts.
- Screw the chain cover nuts.
- Screw the eccentric stop bolt (use hard locking agent).
- Install the chain puller and screw the chain puller spring fixing bolt (with hard locking agent).
- Lubricate the chain puller spacer and screw the chain puller fixing bolt.
- Install the chain guard seal and screw the fixing bolts.
- Install the sprocket drive cover and screw the fixing bolts.
- Lubricate the swing arm bearings.
- Install the swing arm and install the axle (by the left side).
- Screw the rear wheel axle nut.
- Install the chain.
- Install the rear wheel (see "rear wheel installation").
- Install the license plate support (see "side covers installation")



## 14 Shock absorber :



### 14.1 Rear shock absorber removal :

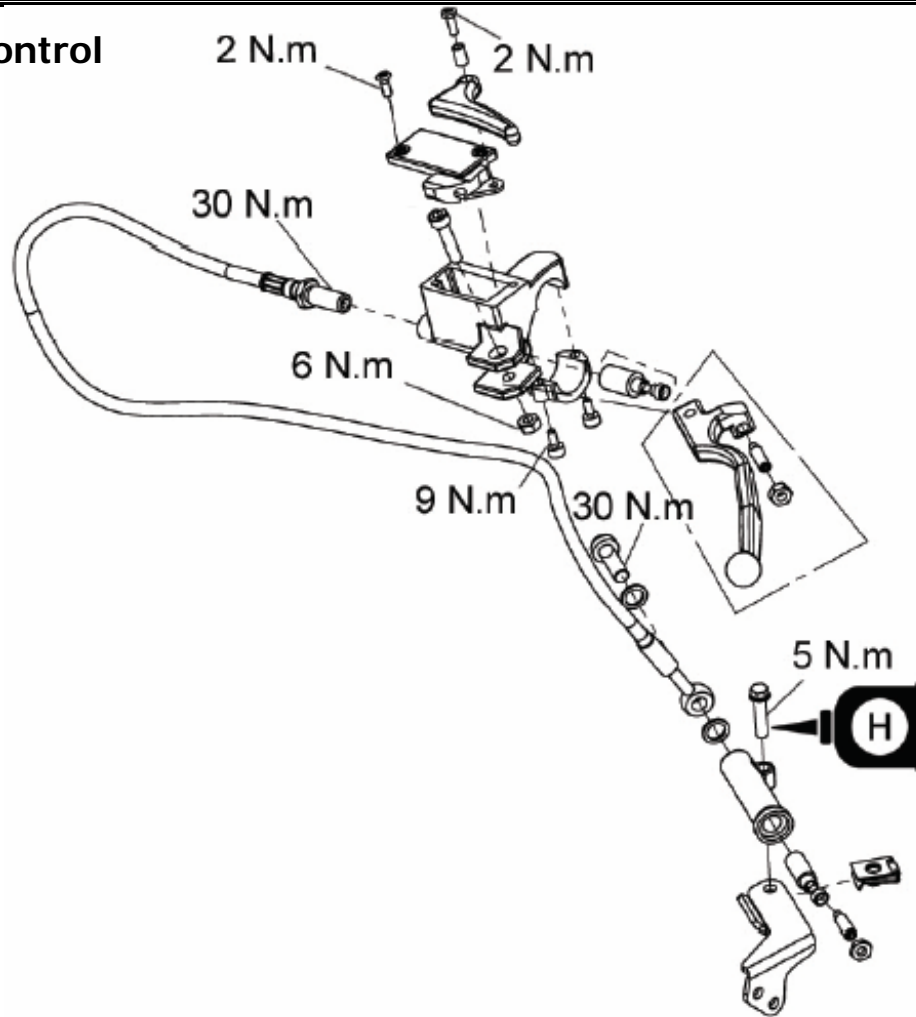
- Remove the air cleaner case (see « air cleaner case removal »).
- Unscrew and take out the absorber upper fixing bolt.
- Hold the swing arm to avoid damages.
- Unscrew and take out the absorber lower fixing bolt.
- Take out the absorber.

### 14.2 Rear shock absorber installation :

- Place the absorber.
- Screw the absorber lower fixing bolt.
- Place and hold up the swing arm.
- Screw the absorber upper fixing bolt.
- Install the air cleaner case (see “air cleaner case installation”).



## 15 Clutch control



### 15.1 Clutch control removal :

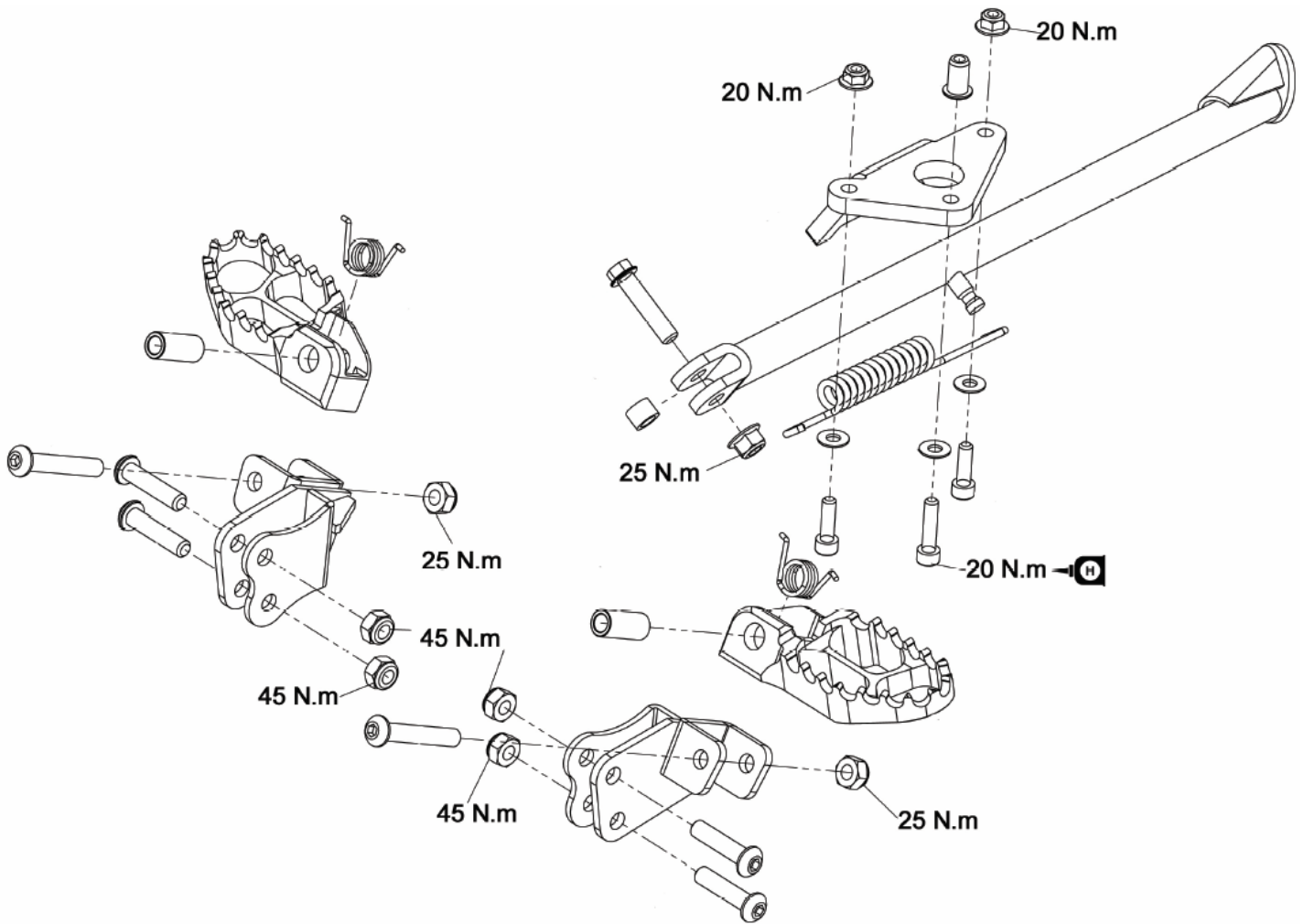
- Remove the air cleaner case (see « air cleaner case removal »).
- Remove the fuel tank (see « fuel tank removal »).
- Unscrew the attaching slave cylinder bolt.
- Remove the slave cylinder.
- To remove the master cylinder from the handlebar : unscrew the 2 master cylinder bracket bolts.
- To remove the master cylinder cover : unscrew the 2 cover bolts (warning : this task must be done the master cylinder fixed to the handlebar, and the bike stable and straight).
- To remove the lever : unscrew the nut then unscrew the bolt and finally remove the lever (be careful to the spacers).
- To remove the hose, unscrew the pipe portion bolt, near the slave cylinder then near the master cylinder (warning : the liquid is corrosive for the painting and dangerous for the body).

### 15.2 Clutch control installation :

- To install the hose : screw the pipe portion bolt to the master cylinder after changing the washer seals, then screw the pipe portion bolt the slave cylinder after changing the washer seals.
- To install the lever : put the 2 spacers then screw the bolt after positioning the lever and finally, screw the nut.
- To install the master cylinder cover : screw the 2 cover bolts.
- To install the master cylinder on the handlebar : install the bracket and screw the 2 fixing bolts.
- Install the slave cylinder.
- Screw the slave cylinder fixing bolt with hard locking agent.
- Install the air cleaner case (see "air cleaner case installation").
- Install the fuel tank (see "fuel tank installation").
- Warning : if the hose has been removed, you must air bleed the clutch control.



## 16 Side stand and footrest :



### 16.1 Side stand and footrests removal :

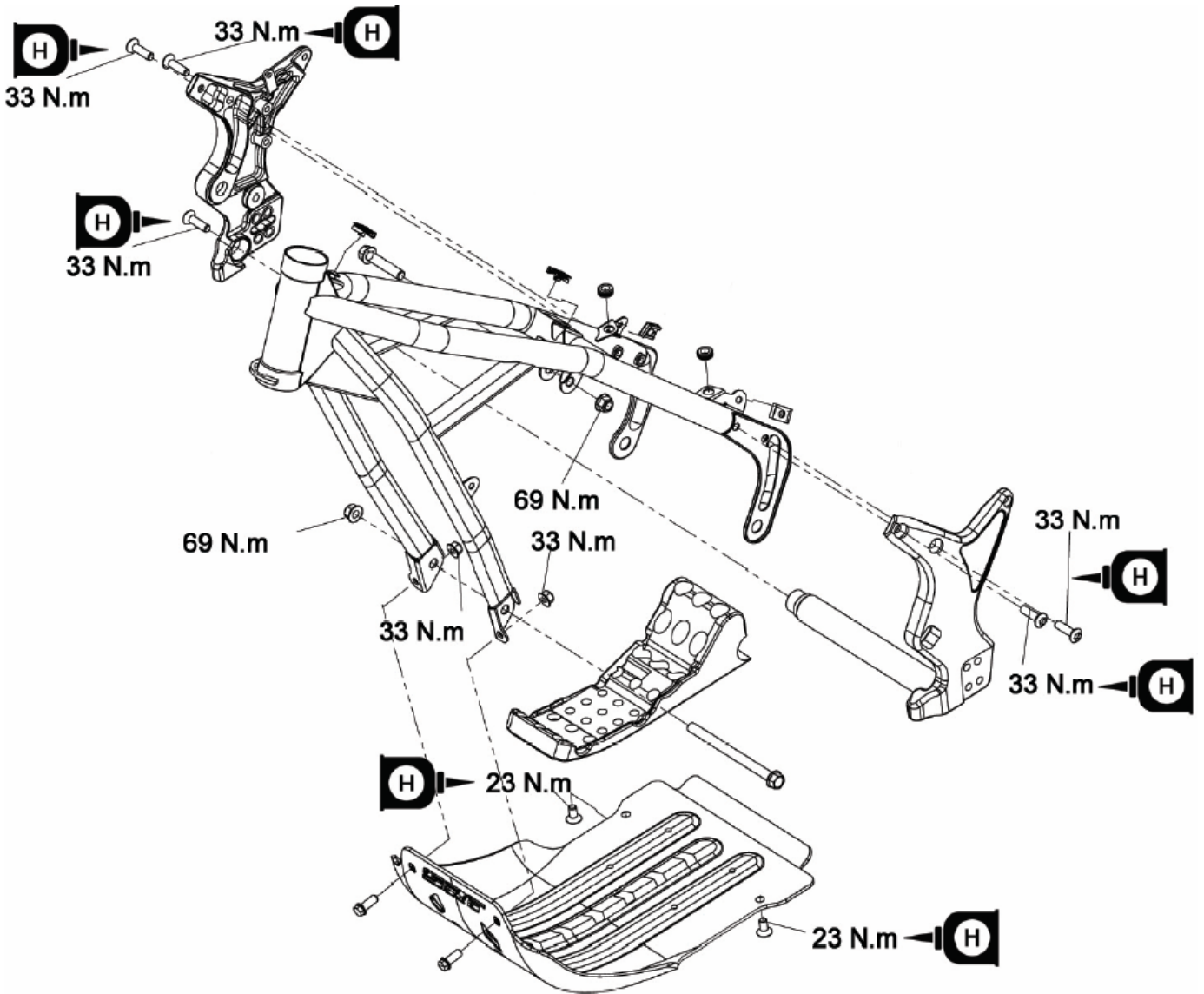
- Unscrew the side stand bracket bolts.
- Remove the side stand bracket.
- Unscrew the side stand axle nut.
- Take out the bolt.
- Take out the side stand.
  
- Unscrew the footrest nut.
- Remove the footrest fixing bolt.
- Take out the footrest from the bracket.
- Take out the spacer (be careful of the spring).
- Unscrew the footrest bracket fixing nuts.
- Take out the bolts and take out the bracket.

### 16.2 Side stand and footrests installation :

- Place the side stand on the bracket and put the bolt and the spacer.
- Screw the side stand axle nut.
- Screw the side stand bracket fixing bolt (use hard locking agent).
  
- Place the footrest bracket on the frame and put the bolts.
- Screw the nuts.
- Put the spacer in the footrest with the spring.
- Place the footrest on the bracket and put the bolt.
- Screw the footrest axle nut.



17 Frame :





### 17.1 Engine removal :

- Unscrew the 2 guard engine rear fixing bolts.
- Unscrew the 2 guard engine front fixing nuts.
- Remove the guard engine front bolts.
- Remove the clutch control (see "clutch control removal").
- Remove the handle crowns (see "handle crown removal").
- Remove the swing arm (see "swing arm removal").
- Remove the carburettor (see "carburettor removal").
- Remove the fuel tank (see "fuel tank removal").
- Remove the radiator (see "radiator removal").
- Remove the rear brake master cylinder (see "rear brake control removal").
- Unplug the electric cables near the front light and near the switches, then unscrew the bolt linking the electric cables to the frame and remove it.
- Remove the footrests (see "side stand and footrest removal").
- Unscrew the 3 right lower frame fixing bolts and remove the lower frame.
- Unscrew the 2 left lower frame fixing bolts and remove the lower frame.
- Remove the engine guard pad.
- Unscrew the 2 engine fixing bolts and remove it.
- Remove the main frame from the motor.

### 17.2 Engine installation :

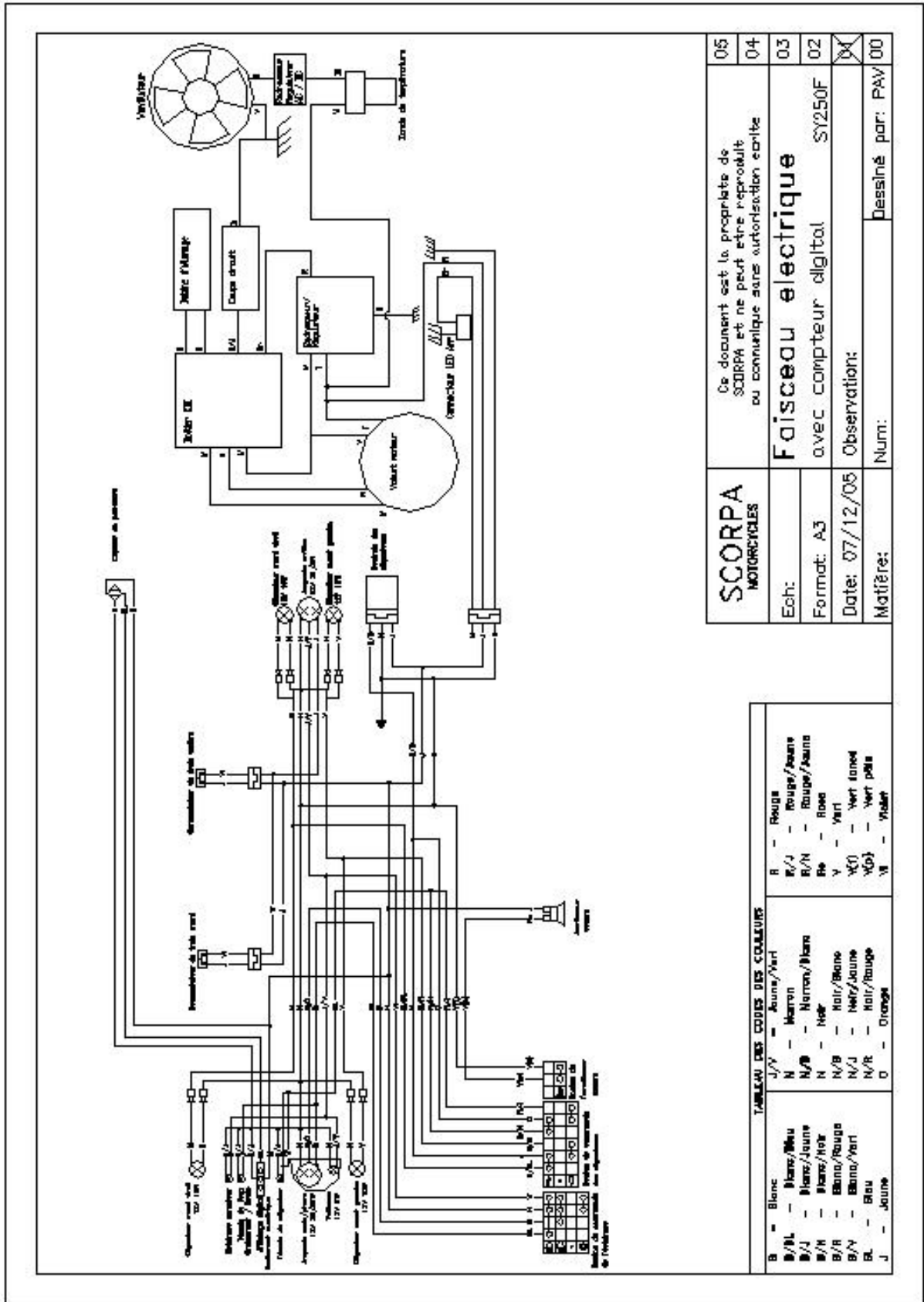
- Install the main frame on the engine.
- Place the 2 frame fixing bolts and place the nuts.
- Install the clutch control (see "clutch control installation").
- Install the engine guard pad.
- Install the left lower frame and place the 2 fixing bolts (with hard locking agent).
- Install the right lower frame and place the 3 fixing bolts (with hard locking agent).
- Install the swing arm (see "swing arm installation") (without installing the rear wheel).
- Screw the lower frames bolts.
- Screw the engine fixing bolts on the frame near the cylinder.
- Screw the engine fixing bolts on the frame in the front.
- Install the footrests (see "side stand and footrests installation").
- Plug the electric cables near the front light and near the switches, then screw the bolt linking the electric cables to the frame.
- Install the rear brake master cylinder (see "rear brake control" installation).
- Install the radiator (see "radiator installation").
- Install the fuel tank (see "fuel tank installation").
- Install the carburettor (see "carburettor installation").
- Install the swing arm (see "swing arm installation").
- Install the handle crowns (see "handle crowns installation").
- Install the engine guard and place the rear and front fixing bolts (use hard locking agent for the rear bolts).
- Screw the engine guard front fixing nuts then screw the rear fixing bolts.



**ELECTRICAL**



1 ELECTRICAL  
1.1 Wiring diagram

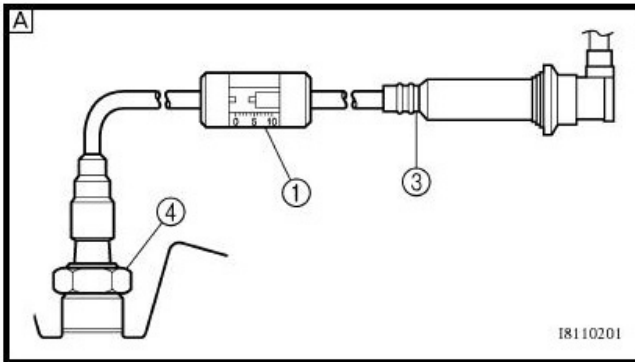


SCORPA MOTORCYCLES	Ce document est la propriété de SCORPA et ne peut être reproduit ou communiqué sans autorisation écrite		05
			04
	<b>Faisceau électrique</b>		03
	avec compteur digital SY250F		02
Date: 07/12/05		Observation:	X
Matériau:		Num:	00
		Dessiné par: PAV	





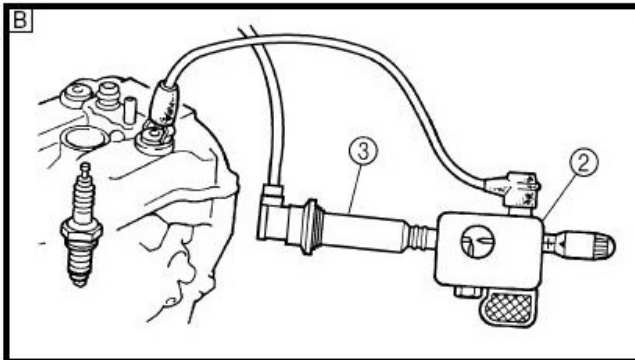
## 1.2 Spark gap test



1. Disconnect the spark plug cap from spark plug.
2. Remove the ignition coil cap.
3. Connect the dynamic spark tester ① (ignition checker ②) as shown.
  - Ignition coil ③
  - Spark plug ④

**A** For USA and CDN

**B** Except for USA and CDN

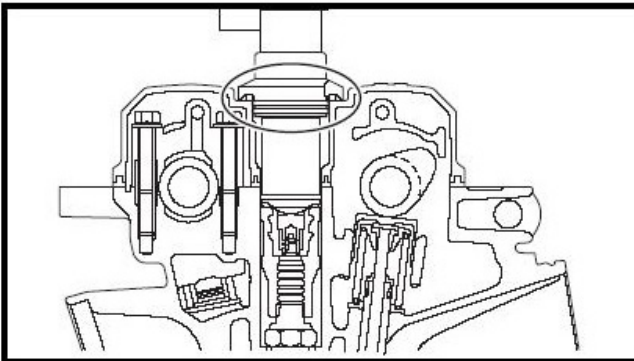


4. Kick the kickstarter crank.
5. Check the ignition spark gap.
6. Start engine, and increase spark gap until misfire occurs. (for USA and CDN only)



**Minimum spark gap:**  
6.0 mm (0.24 in)

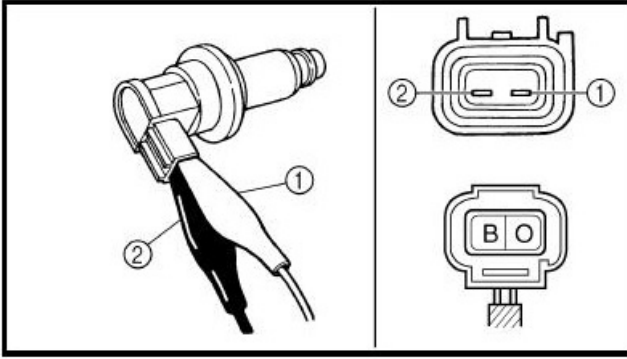
## 1.3 Leads and ignition coil connection inspection



1. Check:
  - Couplers and leads connection  
Rust/dust/looseness/short-circuit → Repair or replace.
  - Ignition coil and spark plug as they are fitted  
Push in the ignition coil until it closely contacts the spark plug hole in the cylinder head cover.



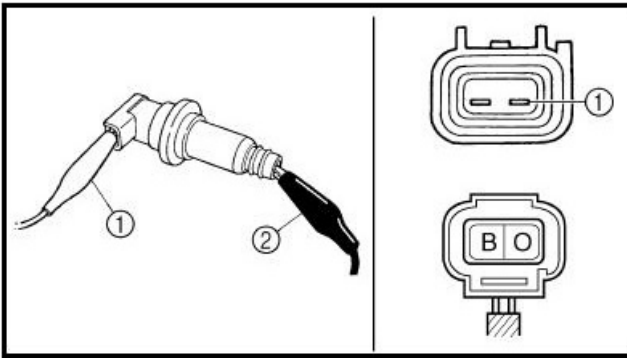
1.4 Ignition coil inspection



1. Inspect:
- Primary coil resistance  
Out of specification → Replace.

**Tester (+) lead → Orange lead ①**  
**Tester (-) lead → Black lead ②**

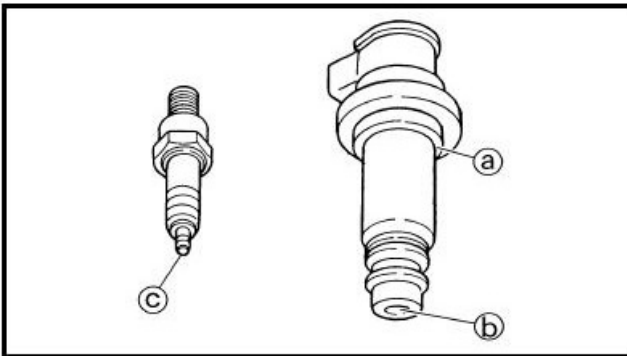
	<b>Primary coil resistance</b>	<b>Tester selector position</b>
	0.08 ~ 0.10 Ω at 20 °C (68 °F)	Ω × 1



2. Inspect:
- Secondary coil resistance  
Out of specification → Replace.

**Tester (+) lead → Orange lead ①**  
**Tester (-) lead → Spark plug terminal ②**

	<b>Secondary coil resistance</b>	<b>Tester selector position</b>
	4.6 ~ 6.8 kΩ at 20 °C (68 °F)	kΩ × 1



3. Inspect:
- Sealed portion of ignition coil (a)
  - Spark plug terminal pin (b)
  - Threaded portion of spark plug (c)  
Wear → Replace.