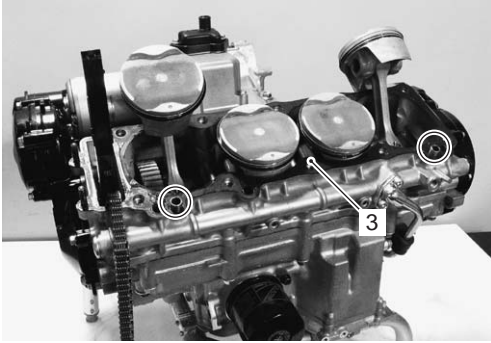


## 1D-31 Engine Mechanical:

- Remove the dowel pins and cylinder base gasket (3).



I823H1140050-03

### Piston

#### NOTE

The piston can not be serviced with the engine installed in the frame.

- Place a clean rag over the cylinder base so as not to drop the piston pin circlips into the crankcase.
- Remove each piston pin circlip (1).

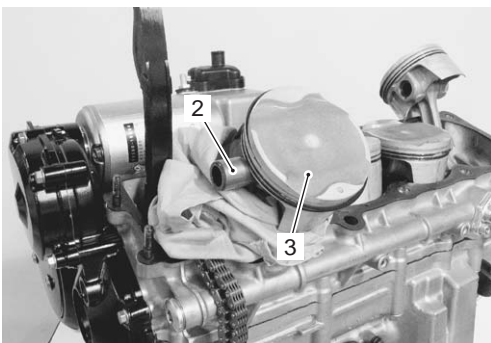


I823H1140051-02

- Draw out each piston pin (2) and remove the piston (3).

#### NOTE

Scribe the cylinder number on the piston head.



I823H1140052-01

## Engine Top Side Assembly

B815H21406020

Assemble the engine top side in the reverse order of disassembly. Pay attention to the following points:

### Piston

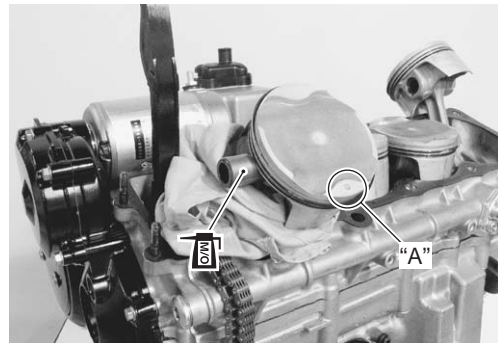
- When installing the pistons, apply molybdenum oil solution onto each piston pin.

**M/O: Molybdenum oil (MOLYBDENUM OIL SOLUTION)**

- Install the pistons and piston pins.

#### NOTE

- Be sure to install the pistons in the cylinders from which they were removed in disassembly, refer to the cylinder numbers, #1 through #4, scribed on the piston.
- When installing the pistons, the indent "A" on the piston head must be faced to exhaust side.



I823H1140053-01

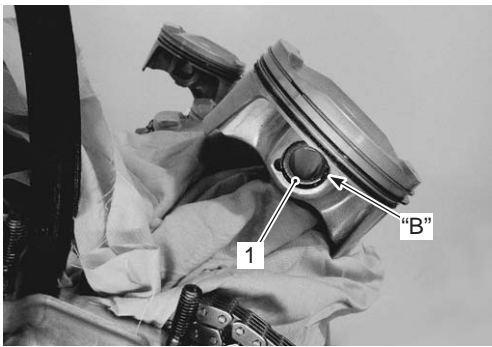
- Place a clean rag over the cylinder base so as not to drop the piston pin circlips (1) into the crankcase.
- Install the piston pin circlips (1).

#### ⚠ CAUTION

Use new piston pin circlips (1) to prevent circlip failure which will occur when it is bent.

**NOTE**

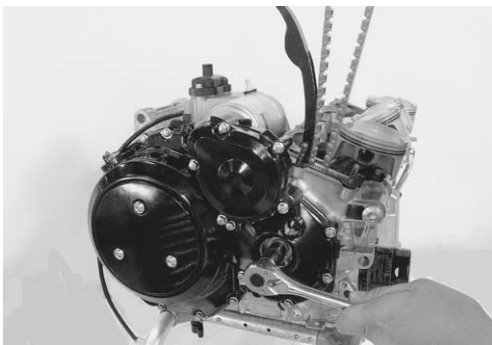
End gap of the circlip "B" should not be aligned with the cutaway in the piston pin bore.



I815H1140050-01

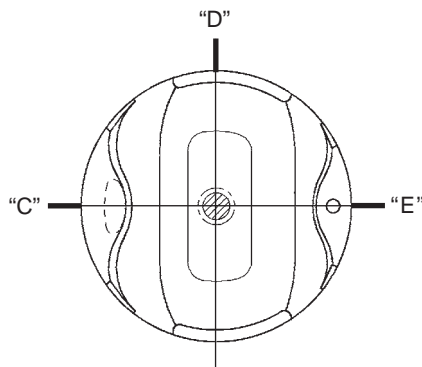
**CAUTION**

When turning the crankshaft, pull the cam chain upward, or the chain will be caught between the crankcase and the cam drive sprocket.



I823H1140055-01

- Position the gaps of the three rings and side rails as shown in the figure. Before inserting piston into the cylinder, check that the gaps are so located.



I823H1140573-02

"C": 1st ring and upper side rail
"D": Spacer
"E": 2nd ring and lower side rail

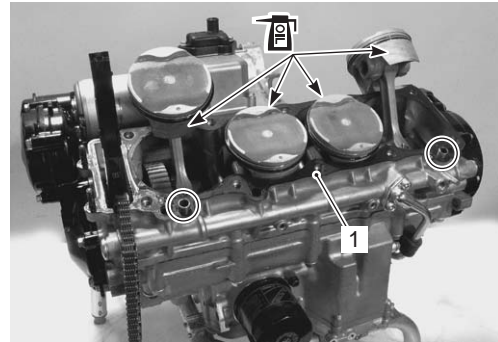
**Cylinder**

- Fit the dowel pins and a new gasket (1) to the crankcase.

**CAUTION**

Use a new gasket to prevent oil leakage.

- Apply engine oil to the sliding surface of the pistons.



I823H1140056-01

- Install special tools to the No. 2 and No. 3 pistons.

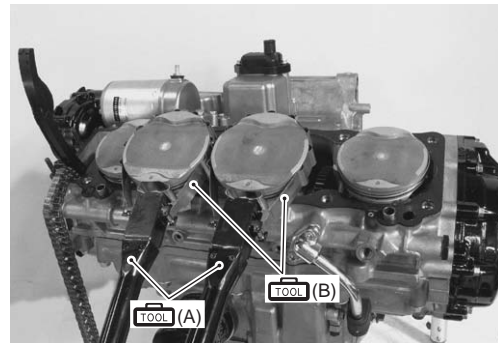
**Special tool**

**TOOL (A): 09916-74521 (Holder body)**

**TOOL (B): 09916-74550 (Band (Piston diam.: 73 – 85 mm))**

**NOTE**

Do not overtighten the bands, or the piston installation into the cylinders will be difficult.



I823H1140057-01

## 1D-33 Engine Mechanical:

- Insert the No. 2 and No. 3 pistons into the cylinder.

### NOTE

**Some light resistance must be overcome to lower the cylinder.**

- After inserting the No. 2 and No. 3 pistons in place, insert the No. 1 and No. 4 pistons in the same manner of the No. 2 and No. 3 pistons.

### NOTE

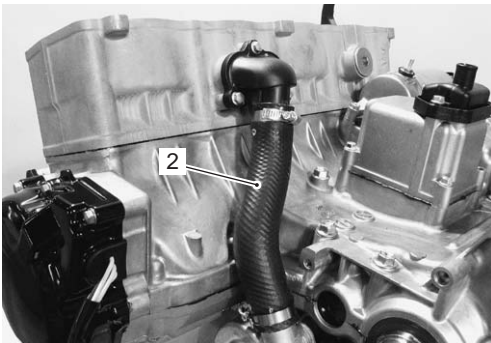
**When installing the cylinder block, keep the cam chain taut. The cam chain must not be caught between cam drive sprocket and crankcase when turning the crankshaft.**

- Tighten the cylinder nuts (M6) temporarily.



I823H1140058-01

- Install the water hose (2).



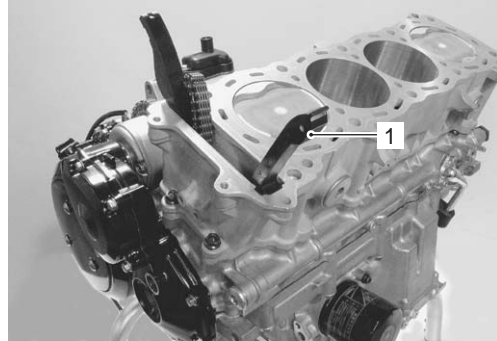
I823H1140059-01

## Cylinder Head

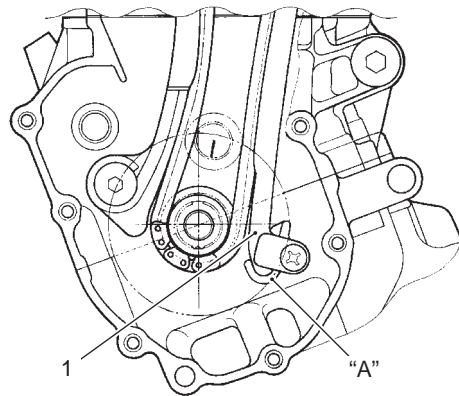
- Pull the cam chain out of the cylinder and install the cam chain guide No. 1 (1).

### CAUTION

- There is the guide holder "A" for the bottom end of the cam chain guide No. 1 (1) cast in the crankcase.
- Be sure that the cam chain guide No. 1 (1) is installed properly.



I823H1140060-01

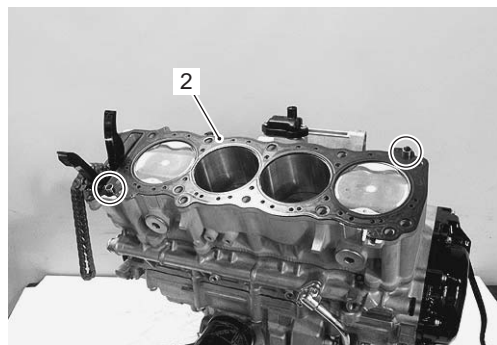


I823H1140061-01

- Fit the dowel pins and a new cylinder head gasket (2) to the cylinder.

### CAUTION

**Use a new gasket to prevent gas leakage.**

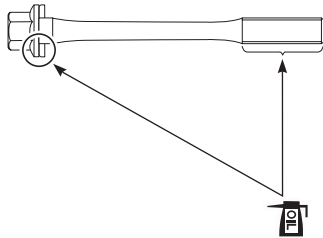


I823H1140062-01

- Place the cylinder head on the cylinder.

**NOTE**

- When installing the cylinder head, keep the cam chain taut.
- Apply engine oil to the washers and thread portion of the bolts before installing the cylinder head bolts.



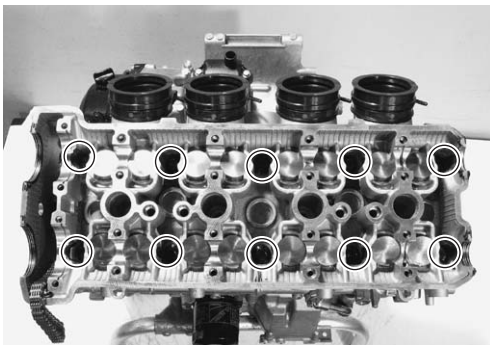
I823H1140063-01

- Tighten the cylinder head bolts (M10) to the specified two-step torque with a torque wrench sequentially and diagonally.

**Tightening torque**

Cylinder head bolt (M10) (Initial): 25 N·m (2.5 kgf·m, 18.0 lb-ft)

Cylinder head bolt (M10) (Final): 52 N·m (5.2 kgf·m, 37.5 lb-ft)



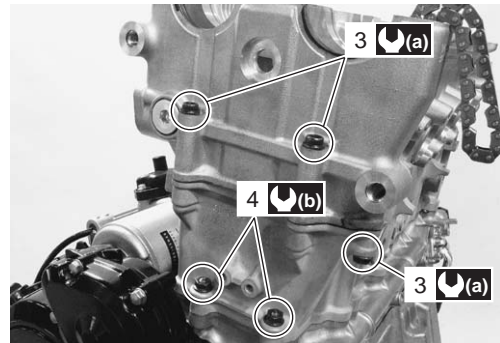
I823H1140064-01

- After firmly tightening the cylinder head bolts (M10), install the cylinder head bolts (M6) (3).
- Tighten the cylinder head bolts (3) and the cylinder nuts (4) to the specified torque.

**Tightening torque**

Cylinder head bolt (M6) (a): 10 N·m (1.0 kgf·m, 7.0 lb-ft)

Cylinder nut (M6) (b): 10 N·m (1.0 kgf·m, 7.0 lb-ft)



I823H1140065-03

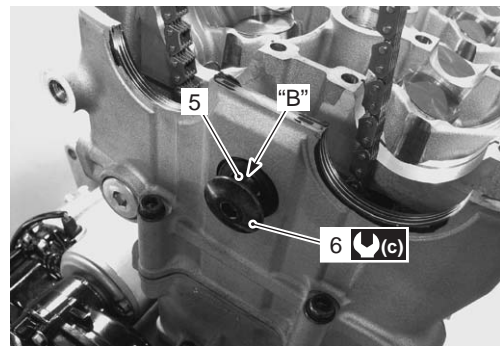
- Install the gasket (5) and cylinder head side bolt (6). Tighten the bolt to the specified torque.

**Tightening torque**

Cylinder head side bolt (c): 14 N·m (1.4 kgf·m, 10.0 lb-ft)

**NOTE**

- The metal side "B" of the gasket (5) should face outside.
- Install the cylinder head side bolt between the cam chain.



I815H1140051-01

- Install the oil hose (7).

**⚠ CAUTION**

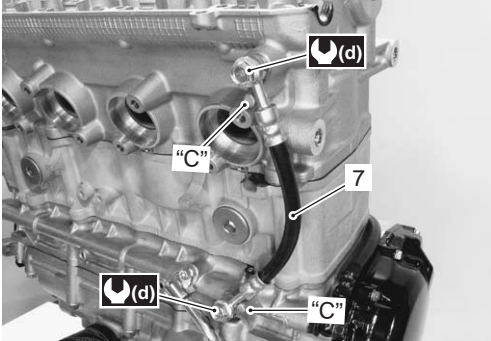
Use new gasket washers to prevent oil leakage.

## 1D-35 Engine Mechanical:

- With the oil hose union contacted to the stopper "C", tighten the bolts to the specified torque.

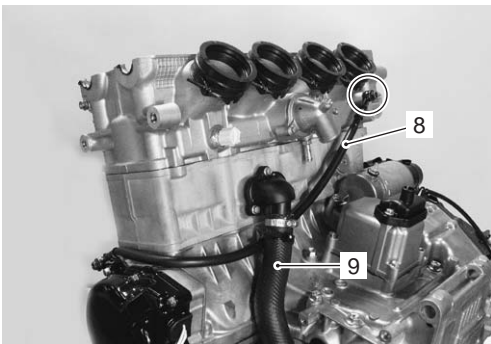
### Tightening torque

Oil hose union bolt (d): 18 N-m (1.8 kgf-m, 13.0 lb-ft)



I815H1140052-01

- Install the oil hose (8) and water hose (9).

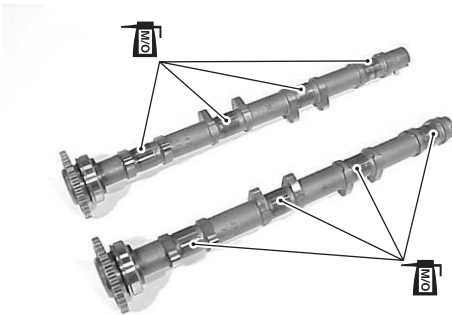


I815H1140053-02

### Camshaft

- The cam shafts are identified by the embossed letters.  
IN: Intake camshaft  
EX: Exhaust camshaft
- Before placing the camshafts on the cylinder head, apply molybdenum oil solution to their journals.

**M/O: Molybdenum oil (MOLYBDENUM OIL SOLUTION)**

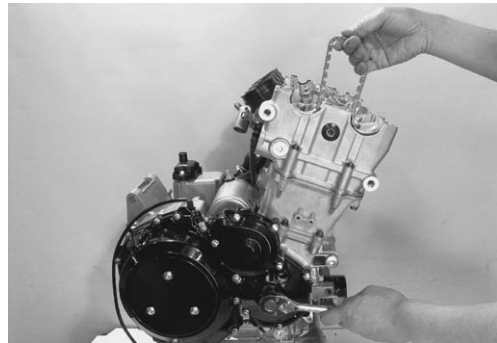


I823H1140069-02

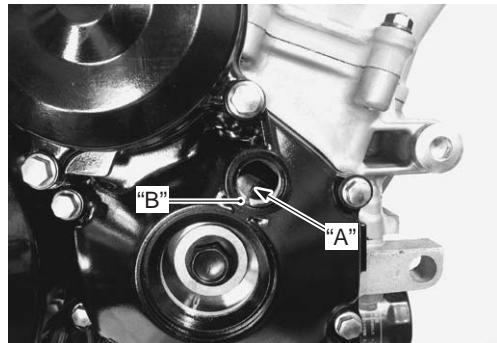
- Turn the crankshaft clockwise and align the line "A" on the starter clutch with the index mark "B" of the valve timing inspection hole while keeping the cam chain pulled upward.

### ⚠ CAUTION

- Pull the cam chain upward, or the chain will be caught between crankcase and cam drive sprocket.
- To adjust the camshaft timing correctly, be sure to align the line "A" with the index mark "B" and hold this position when installing the camshafts.



I823H1140070-01



I823H1140072-01

- Pull the cam chain lightly.
- Turn the exhaust camshaft so that the arrow is aligned with the gasket surface of the cylinder head. (The exhaust camshaft sprocket has an arrow marked "1" "C".)
- Engage the cam chain with the exhaust camshaft sprocket.

**NOTE**

- Before installing the camshaft, check that the tappets are installed correctly.
- Align the C-ring (1) of the exhaust camshaft bearing with the groove "D".

- Bind the cam chain and the sprocket with a proper clamp (2) to prevent the cam chain disengagement while installing the camshaft journal holders.
- The other arrow marked "2" "E" should now be pointing straight up. Starting from the roller pin that is directly above the arrow marked "2" "E", count out 15 roller pins (from the exhaust camshaft side going towards the intake camshaft side).
- Engage the 15th roller pin "F" on the cam chain with the arrow marked "3" on the intake sprocket.

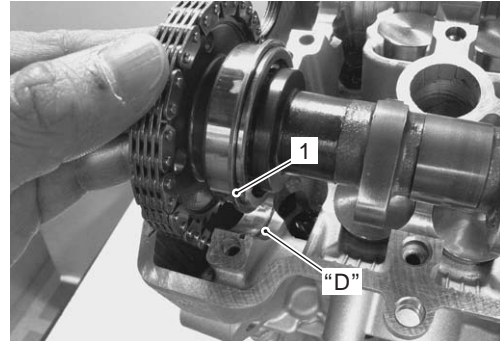
**NOTE**

- Before installing the camshaft, check that the tappets are installed correctly.
- Align the C-ring (3) of the intake camshaft bearing with the groove "G".

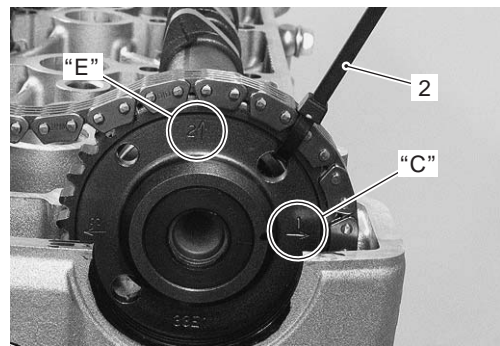
- Bind the cam chain and the sprocket with a proper clamp (4) to prevent the cam chain disengagement while installing the camshaft journal holders.

**NOTE**

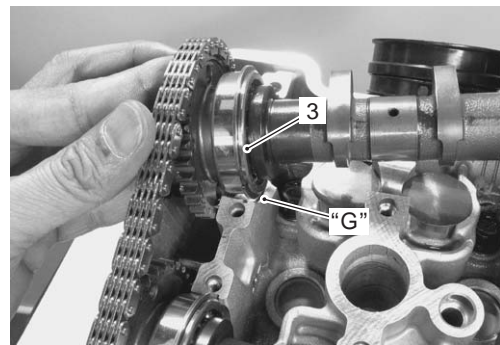
The cam chain should now be on all three sprockets. Be careful not to move the crankshaft until the camshaft journal holders and cam chain tension adjuster are secured.



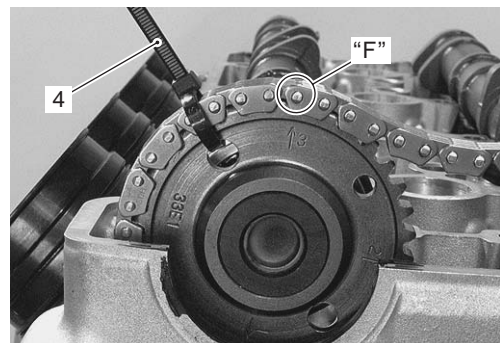
I823H1140073-01



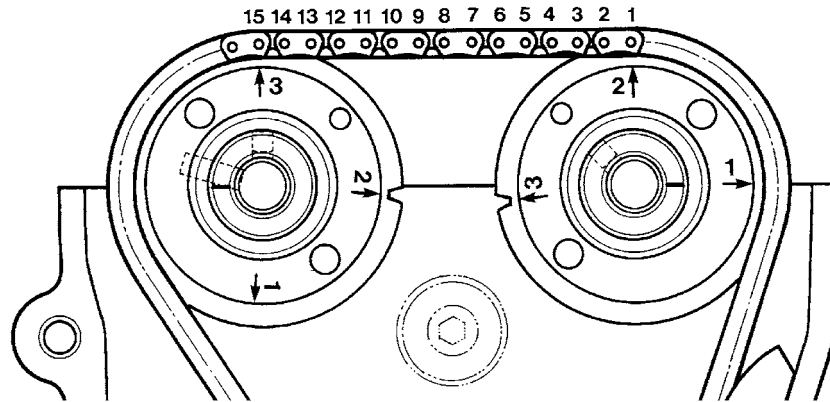
I823H1140074-01



I823H1140075-03

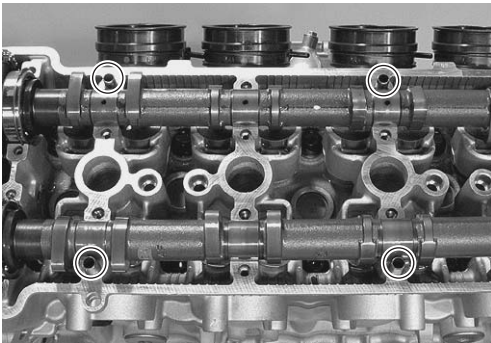


I823H1140076-02



I823H1140077-02

- Install the dowel pins.
- Install the camshaft journal holders.



I823H1140078-01

- Have the camshaft journal holders evenly by tightening the camshaft journal holder bolts lightly, in the ascending order of numbers.

**NOTE**

- **Damage to head or camshaft journal holder thrust surfaces may result if the camshaft journal holders are not drawn down evenly.**
- **Each camshaft journal holder is identified with a cast-on letters “IN” and “EX”.**
- **The ascending order of numbers are indicated on the camshaft journal holders.**

- Tighten the camshaft journal holder bolts in ascending order of numbers to the specified torque.

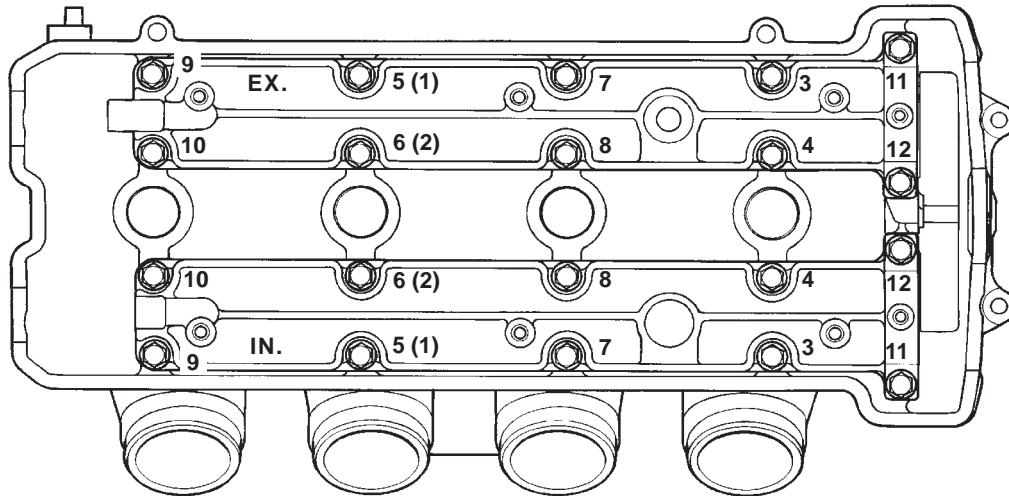
**Tightening torque**

**Camshaft journal holder bolt: 10 N-m (1.0 kgf-m, 7.0 lb-ft)**

**⚠ CAUTION**

**The camshaft journal holder bolts are made of a special material and much superior in strength, compared with other types of high strength bolts.**

**Take special care not to use other types of bolts instead of these special bolts.**



I823H1140079-03

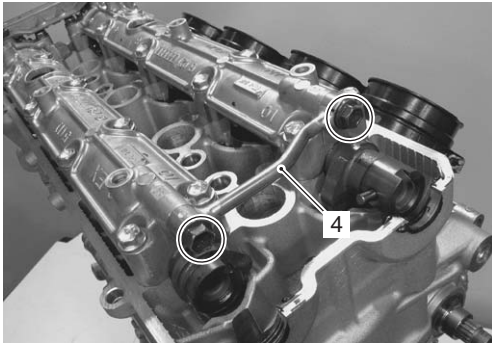
- Install the oil pipe (4) and tighten oil pipe bolts to the specified torque.

**NOTE**

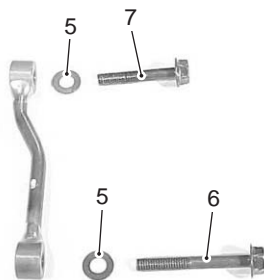
- Install the washer (5) between each bolt and oil pipe.
- The exhaust side oil pipe bolt (6) is longer than the intake side one (7).

**Tightening torque**

Oil pipe bolt (Camshaft housing): 10 N·m (1.0 kgf·m, 7.0 lb·ft)



I823H1140080-01



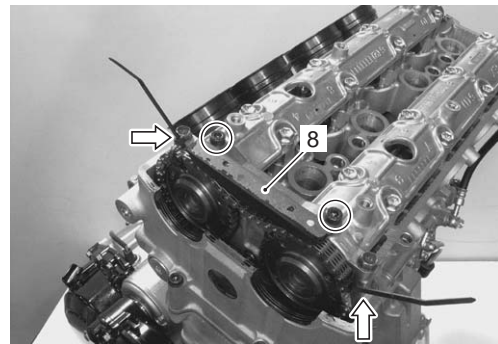
I823H1140081-01

- Install the cam chain guide No. 2 (8).

**Tightening torque**

Cam chain guide No. 2 bolt: 10 N·m (1.0 kgf·m, 7.0 lb·ft)

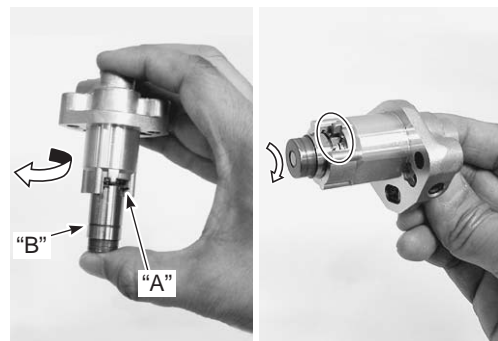
- Remove the clamps.



I823H1140082-01

**Cam Chain Tension Adjuster**

- Holding the cam chain tension adjuster as shown in the figure, compress the plunger by turning the adjuster body until the outer circlip "A" reaches the groove "B".
- Hook the outer circlip "A" into the groove "B", then turn the plunger head clockwise more than 90° to make a little play at the inner thread mechanism.



I823H1140355-01