

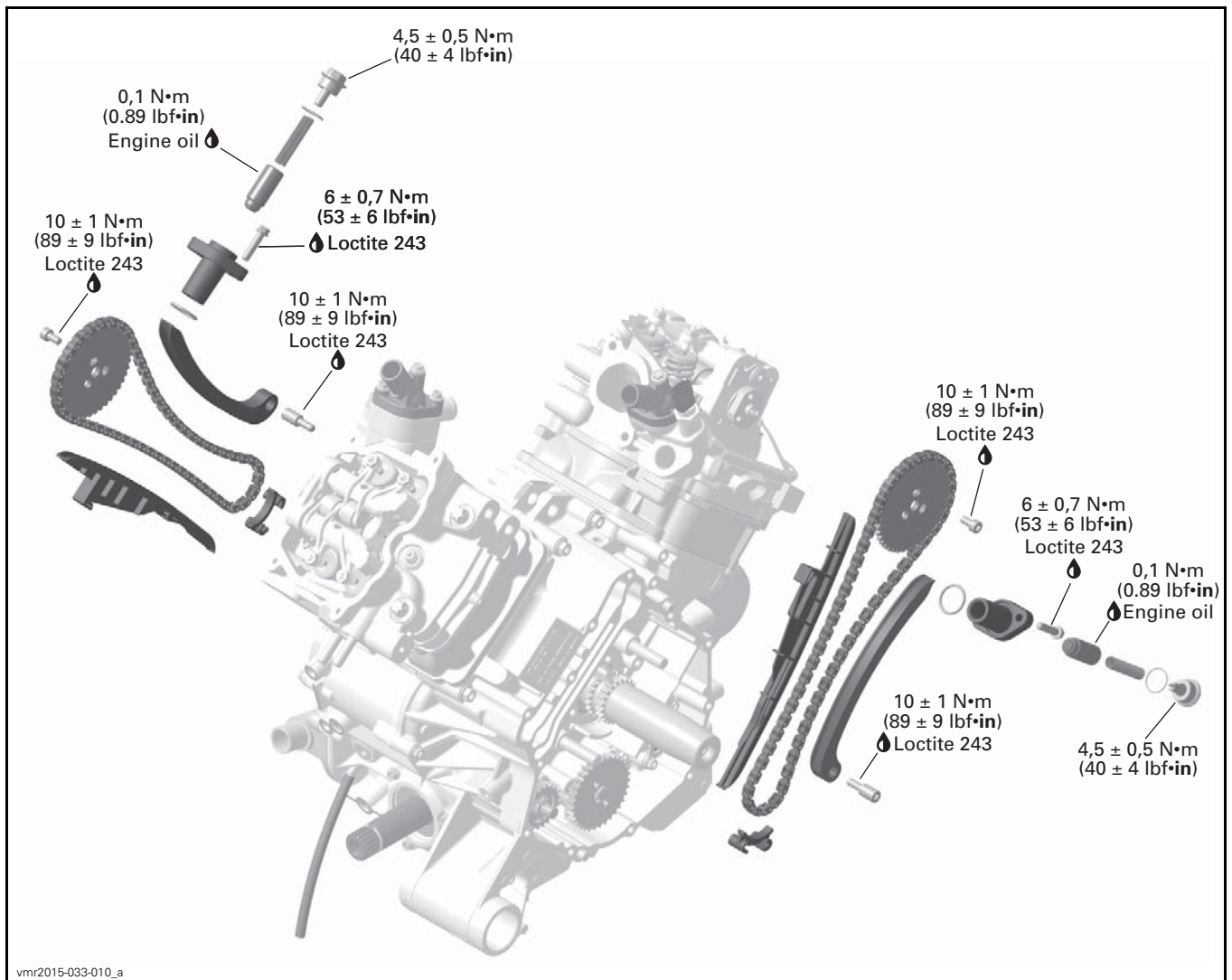
TIMING CHAIN

SERVICE TOOLS

Description	Part Number	Page
CAMSHAFT TIMING TOOL.....	529 036 268	5
CRANKSHAFT TDC POSITION TOOL.....	529 036 201	5, 9

SERVICE PRODUCTS

Description	Part Number	Page
LOCTITE 243 (BLUE).....	293 800 060	6, 11



TROUBLESHOOTING

UNUSUAL ENGINE NOISE OR VIBRATION

1. IMPROPER VALVE CLEARANCE ADJUSTMENT AND/OR WORN OUT ROCKER ARM(S)
 - Readjust valve clearance and/or replace defective part(s), refer to TOP END subsection.
2. DEFECTIVE CHAIN TENSIONER
 - Replace chain tensioner.
3. WORN OUT TIMING CHAIN GUIDE(S)
 - Replace timing chain guide(s).
4. STRETCHED TIMING CHAIN OR WORN OUT TIMING GEARS
 - Replace timing chain and timing gears.
5. LOOSE TIMING GEAR RETAINING SCREWS
 - Retighten screws to recommended torque.
6. INCORRECT CAMSHAFT TIMING
 - Replace damaged components and readjust camshaft timing.

ENGINE LACKS ACCELERATION OR POWER

1. INCORRECT CAMSHAFT TIMING
 - Replace damaged components and readjust camshaft timing.

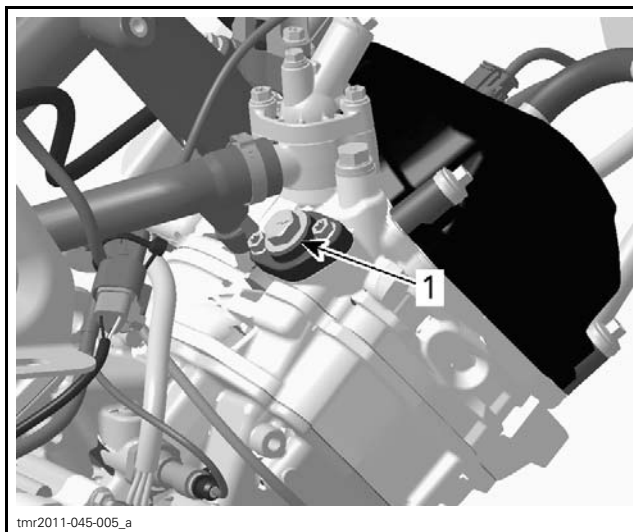
PROCEDURES

TIMING CHAIN TENSIONERS

Timing Chain Tensioner Location

570 Engine

The timing chain tensioner is located on the back of each cylinder head.

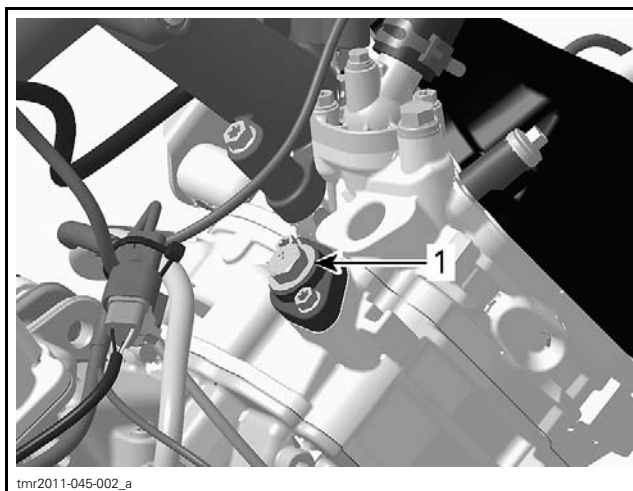


570 ENGINE (FRONT CYLINDER SHOWN)

1. Timing chain tensioner

850 and 1000R Engines

The timing chain tensioner is located in the cylinder der.



850 AND 1000R ENGINES (FRONT CYLINDER SHOWN)

1. Timing chain tensioner

Timing Chain Tensioner Access

For the front cylinder, the chain tensioner is accessible from the RH side.

For the rear cylinder chain tensioner, remove the exhaust system outer heat shield. Refer to EXHAUST SYSTEM subsection.

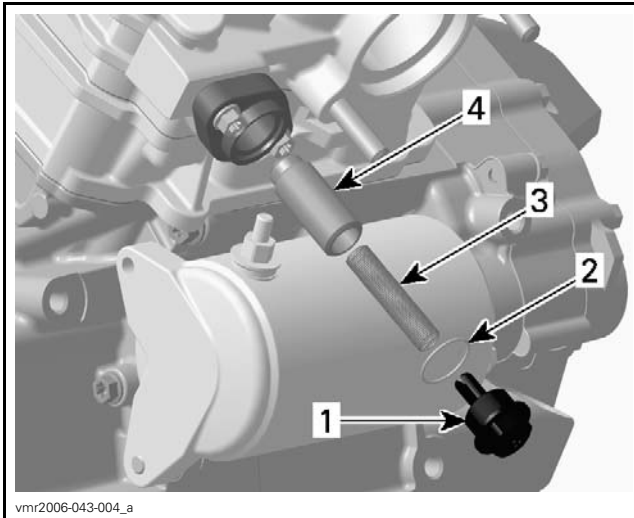
Removing the Timing Chain Tensioner

1. Make sure the applicable piston is set to TDC ignition. Refer to CAMSHAFT TIMING GEARS in this subsection.
2. Carefully remove chain tensioner screw plug and release spring tension.

⚠ CAUTION Tensioner is spring loaded.

3. Remove:

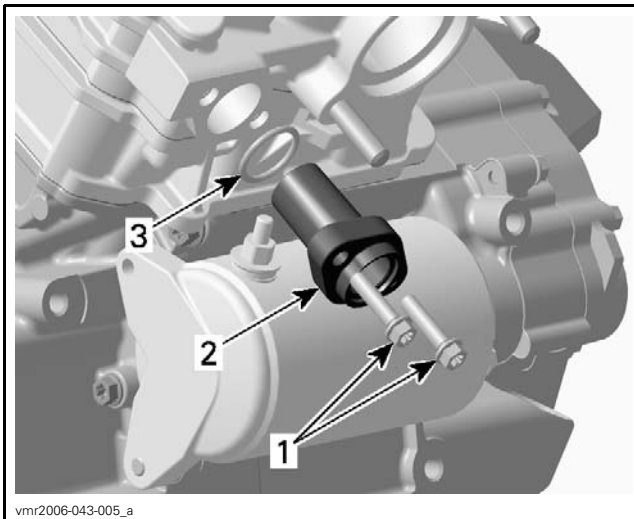
- O-ring
- Spring
- Chain tensioner plunger.



1. Chain tensioner screw plug
2. O-ring
3. Spring
4. Chain tensioner plunger

4. Remove:

- Chain tensioner housing retaining screws
- Chain tensioner housing
- O-ring.



1. Screws
2. Chain tensioner housing
3. O-ring

Inspecting the Timing Chain Tensioner

Check chain tensioner housing and screw plug for cracks or other damages. Replace if necessary.

Check chain tensioner plunger for freedom of movement and/or scoring.

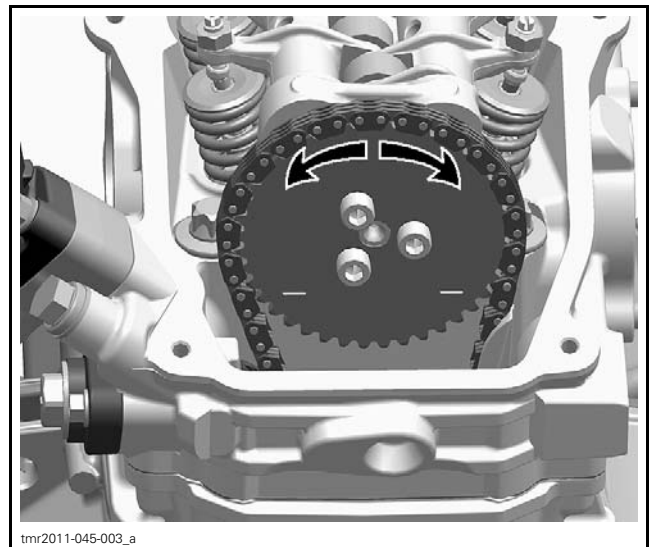
Ensure O-rings are not brittle, cracked or hard. Replace if necessary.

Check spring condition. Replace if bent, broken or worn.

Installing the Timing Chain Tensioner

Reverse the removal procedure. However, pay attention to the following.

NOTE: Before installing the chain tensioner, make sure the camshaft timing gear can be moved back and forth.



MOVE GEAR BACK AND FORTH

1. Apply engine oil on the chain tensioner plunger before installation.
2. Slightly turn the camshaft timing gear in order to move the timing chain excess play to the tensioner side.
3. Slightly screw in the plunger until the timing chain does not allow back and forth movement of the camshaft timing gear.
4. Screw the plunger in an additional 1/8 turn to obtain the required specified torque.

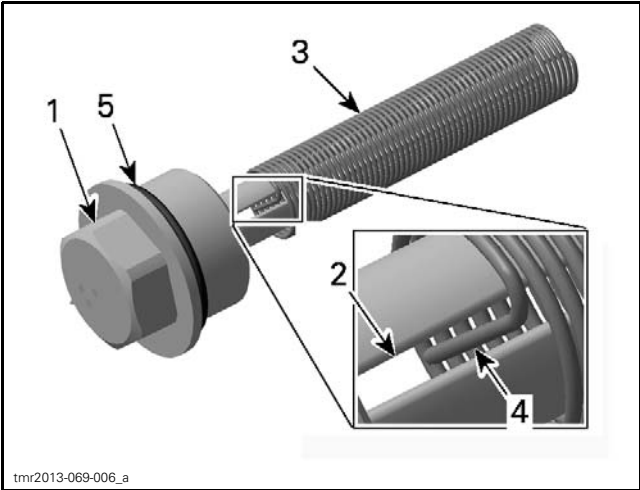
TIMING CHAIN TENSIONER ADJUSTMENT (TIGHTENING TORQUE)

0.1 N•m (.9 lbf•in)

NOTICE Improper adjustment of the timing chain will lead to severe engine damage.

5. Place the O-ring on chain tensioner screw plug.
6. Fit the spring on one side into the slot of the chain tensioner screw plug.

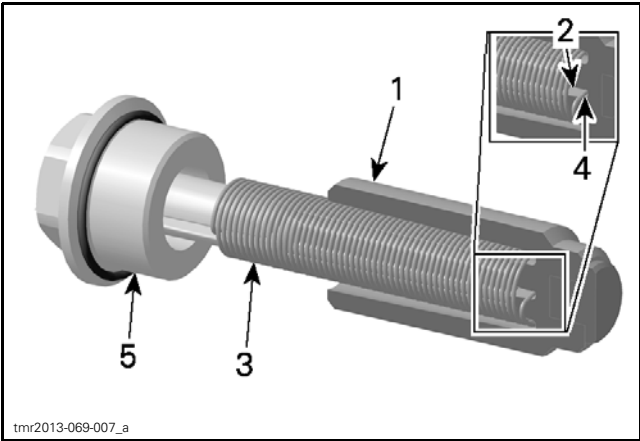
Subsection 09 (TIMING CHAIN)



- 1. Plug
- 2. Slot
- 3. Spring
- 4. Spring end
- 5. O-Ring

7. Fit the spring on the other side into the plunger.

NOTE: Turn spring only clockwise in order to fit the spring end into the notch of the plunger to avoid loosening the plunger during spring installation. Do not preload the spring.

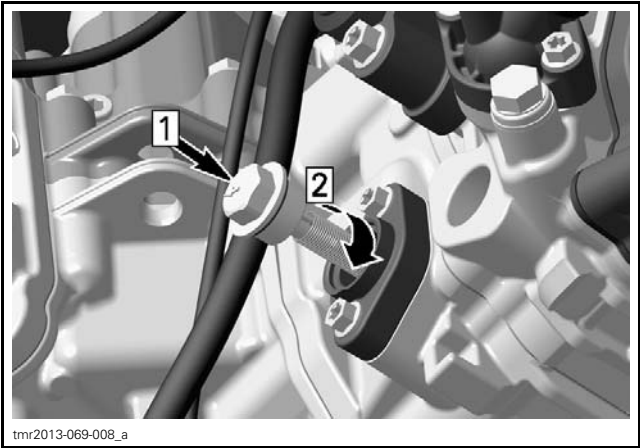


FOR CLARITY PARTS ARE REMOVED FROM CYLINDER

- 1. Plunger
- 2. Notch
- 3. Spring
- 4. Spring end
- 5. Plug with O-ring

8. Then compress the spring and screw the plug in.

NOTE: To avoid overstressed timing chain, the plug must engage into threads within the first full turn.



Step 1: Compress spring
Step 2: Screw in plug

9. Remove locking tool and install all other removed parts.

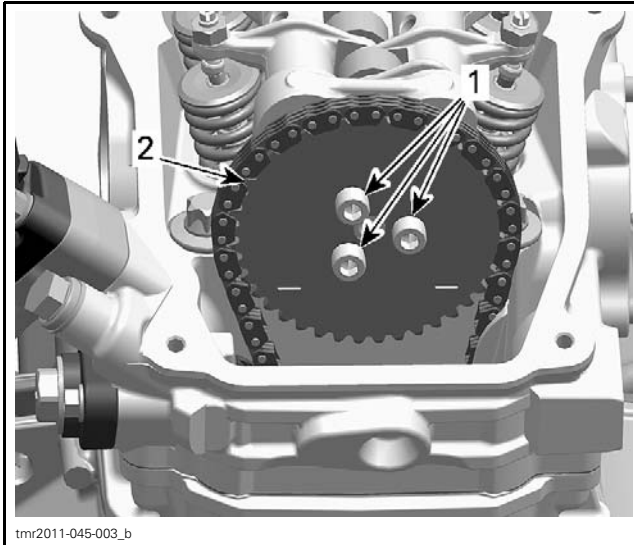
10. Tighten the chain tensioner screw plug to specification.

TIGHTENING TORQUE	
Chain tensioner plug	4.5 N•m ± 0.5 N•m (40 lbf•in ± 4 lbf•in)

CAMSHAFT TIMING GEARS

Removing the Camshaft Timing Gear

1. Remove valve cover, refer to *TOP END* subsection.
2. Set applicable piston to TDC ignition and lock magneto flywheel. Refer to *CAMSHAFT TIMING* in this subsection.
3. Remove timing chain tensioner. Refer to *TIMING CHAIN TENSIONERS* in this subsection.
4. Remove camshaft timing gear retaining screws.



TYPICAL

1. Camshaft timing gear retaining screws
2. Camshaft timing gear

5. Remove the camshaft timing gear.

NOTE: Secure timing chain with a piece of wire.

Inspecting the Camshaft Timing Gear

Check camshaft timing gear for wear or deterioration.

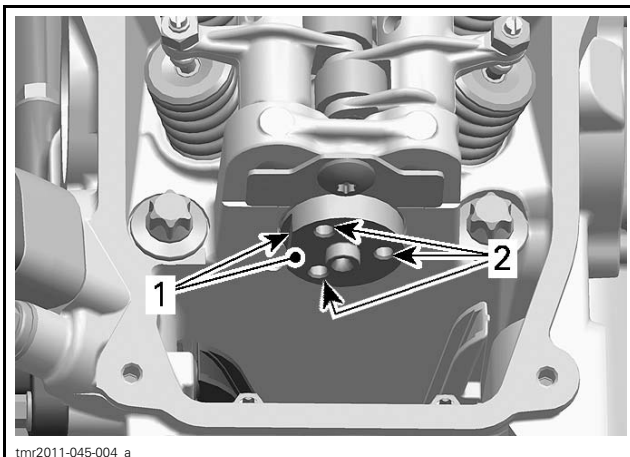
If timing gear is worn or damaged, replace it as a set with the timing chain.

For crankshaft gear inspection, refer to *CRANKSHAFT* in the *BOTTOM END* subsection.

Installing the Camshaft Timing Gear

For installation, reverse the removal procedure. Pay attention to the following details.

1. Clean camshaft mating surface and threads prior to installing camshaft timing gear.



1. Camshaft mating surface
2. Camshaft screw threads

2. Set applicable piston to TDC ignition position and install the crankshaft position tool, refer to *CAMSHAFT TIMING* in this subsection.

REQUIRED TOOL

CRANKSHAFT TDC
POSITION TOOL
(P/N 529 036 201)



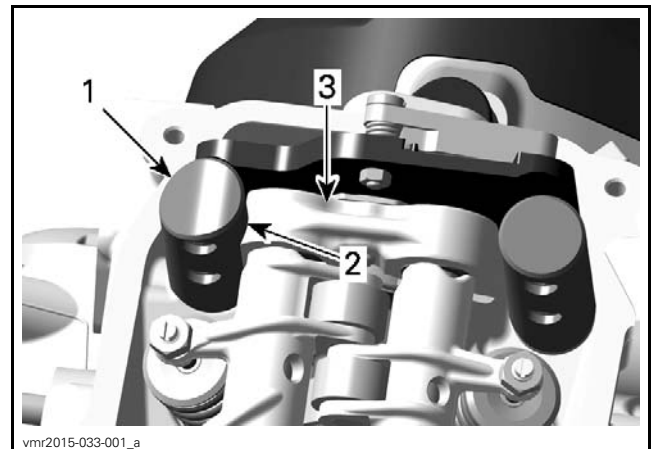
3. Install camshaft timing tool on the cylinder head.

REQUIRED TOOL

CAMSHAFT TIMING TOOL
(P/N 529 036 268)



NOTE: Properly align tube of camshaft timing tool with machined radius on cylinder head.



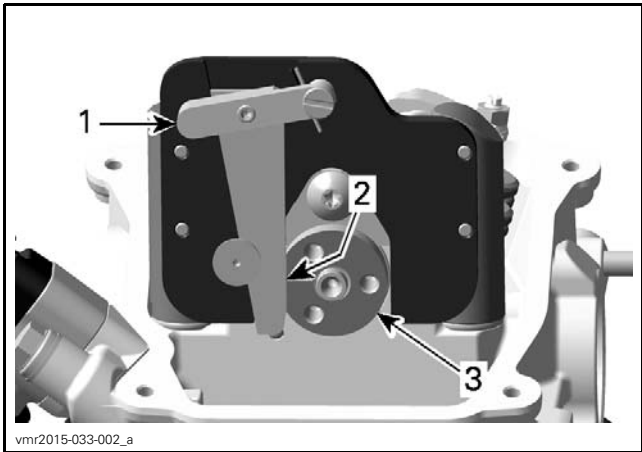
CAMSHAFT TIMING TOOL INSTALLED

1. Tube (camshaft timing tool)
2. Machined radius (camshaft timing tool)
3. Cylinder head

4. Set camshaft to TDC ignition position by aligning the flat portion on the camshaft flange with the tool lever.

NOTE: In addition, to ensure proper camshaft timing, press camshaft timing tool lever downwards.

Subsection 09 (TIMING CHAIN)



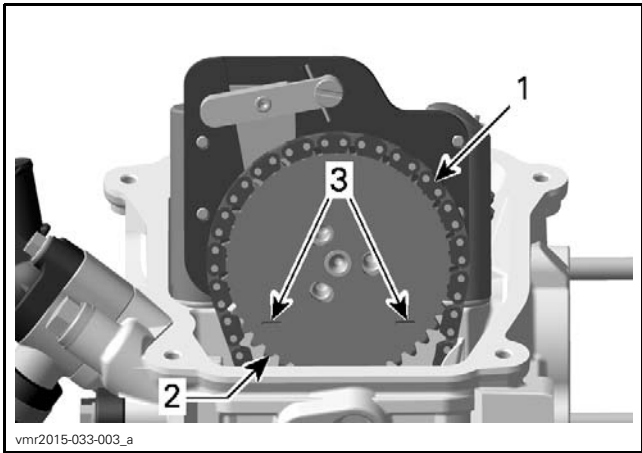
PRESS TOOL LEVER DOWN

- 1. Lever
- 2. Flat portion
- 3. Camshaft

NOTICE Crankshaft and camshaft must be locked at TDC ignition position to place camshaft timing gear and timing chain in the proper position.

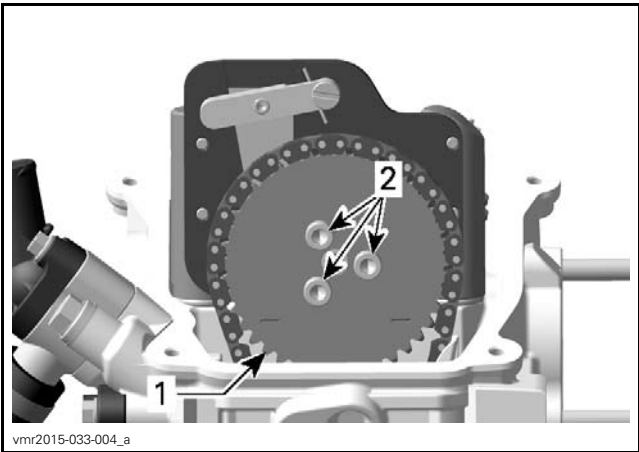
- 5. Place camshaft timing gear and timing chain on the camshaft.

NOTE: The printed marks on the camshaft timing gear must be parallel to the cylinder head base.



- 1. Timing chain
- 2. Camshaft timing gear
- 3. Printed marks on camshaft timing gear

- 6. Install and adjust timing chain tensioner, refer to *TIMING CHAIN TENSIONER* in this subsection.
- 7. Install and tighten camshaft timing gear retaining screws to specified torque.



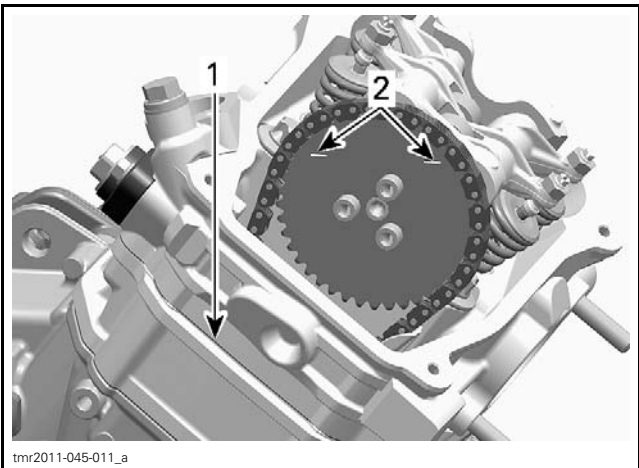
- 1. Camshaft timing gear
- 2. Timing gear retaining screws

TIGHTENING TORQUE	
Service product	LOCTITE 243 (BLUE) (P/N 293 800 060)
Camshaft timing gear retaining screws	10 N•m ± 1 N•m (89 lbf•in ± 9 lbf•in)

- 8. Remove the camshaft timing tool.

Camshaft Timing

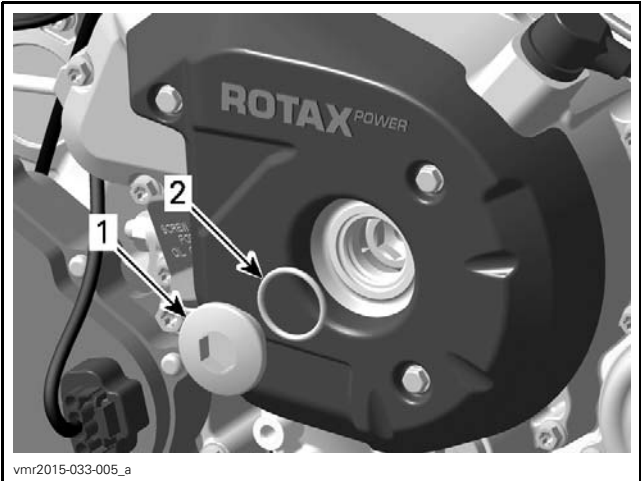
NOTE: If a piston (cylinder 1 or 2) is set to TDC ignition, the camshaft timing gear of the opposite cylinder must be in the following position.



- TYPICAL**
- 1. Cylinder head base
 - 2. Marks on timing gear of the opposite cylinder

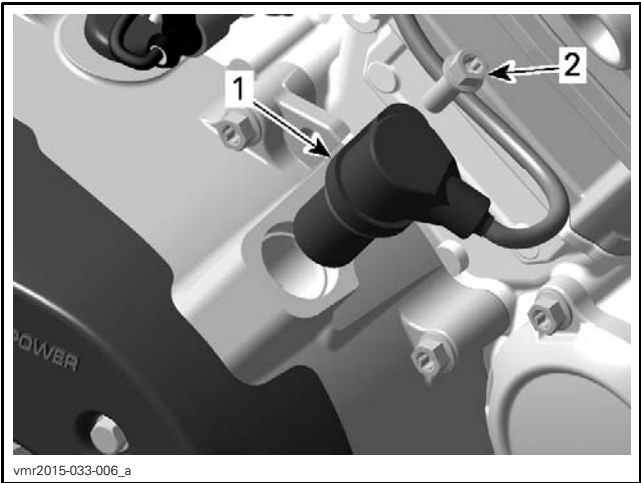
Camshaft Timing Piston No. 2 (rear)

- 1. Remove spark plugs of both cylinders.
- 2. Remove valve covers of both cylinders.
- 3. Remove the screw plug and O-ring from magneto cover.



- 1. Screw plug
- 2. O-ring

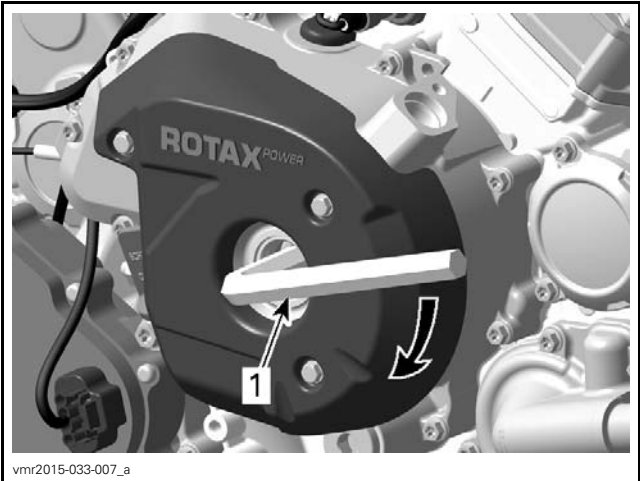
4. Remove the crankshaft position sensor (CPS).



- 1. CPS
- 2. Screw

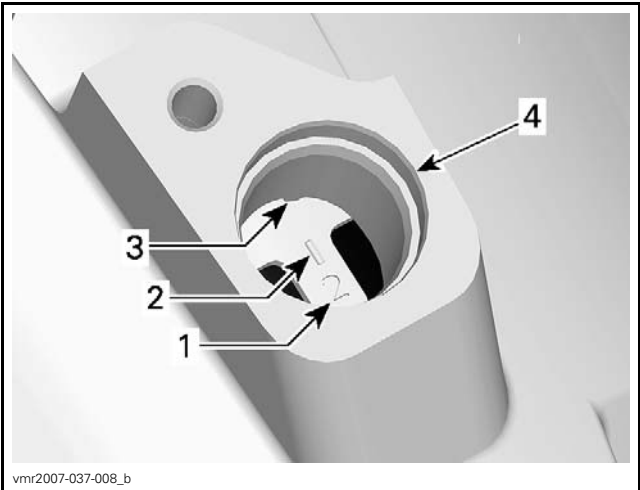
5. Set rear piston no. 2 to TDC ignition by turning the crankshaft clockwise.

REQUIRED TOOL
Allen key 14 mm



TURN CRANKSHAFT CLOCKWISE TO PISTON NO. 2 TDC
1. Allen key 14 mm

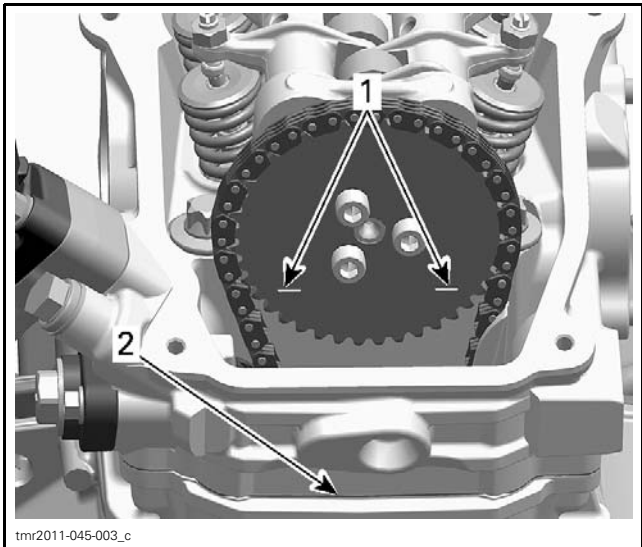
5.1 The rear piston is at TDC when it's index mark on the magneto flywheel is aligned with the notch in the magneto cover.



PISTON NO. 2 AT TDC
1. Piston no. 2 identifier
2. Index mark on magneto flywheel
3. Notch on magneto cover
4. CPS bore in magneto cover

5.2 Confirm printed marks on the camshaft timing gear are parallel with cylinder head base, in the lowest position. In this position the piston is set to TDC ignition.

NOTE: If marks on camshaft timing gear are not as specified, turn crankshaft 360°.



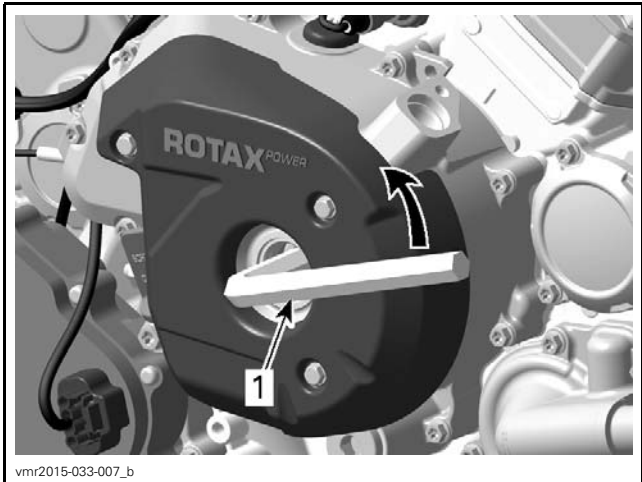
TYPICAL - PISTON AT TDC IGNITION
1. Printed marks on camshaft timing gear
2. Cylinder head base

6. Install the crankshaft TDC position tool to lock crankshaft in position. Refer to *CRANKSHAFT TDC POSITION TOOL* in this subsection.

Camshaft Timing Piston No. 1 (front)

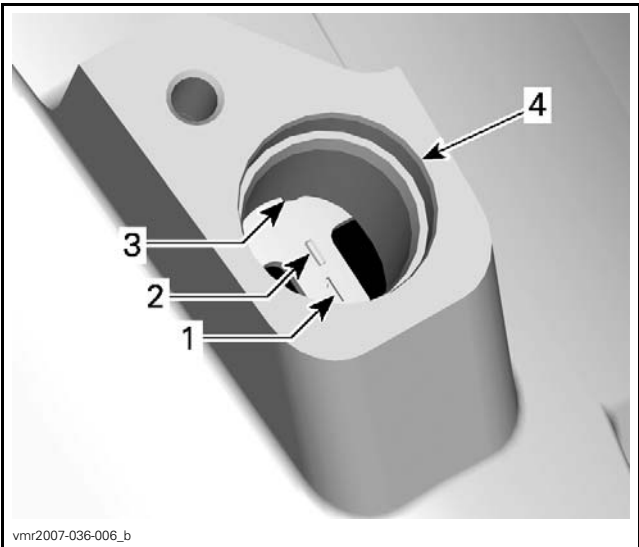
1. Set rear piston no. 2 to **TDC ignition**, see *CAMSHAFT TIMING PISTON NO. 2 (REAR)* in this subsection.
2. Remove crankshaft TDC position tool.
3. To set front piston no. 1 to **TDC ignition** turn crankshaft 280° **counterclockwise**.

REQUIRED TOOL
Allen key 14 mm



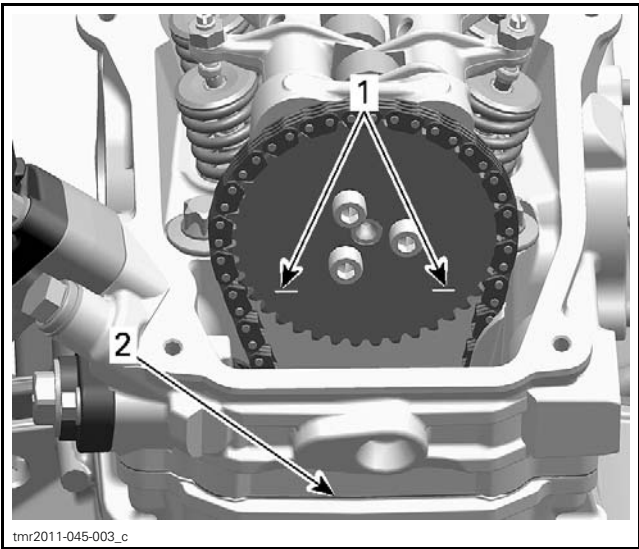
TURN COUNTERCLOCKWISE 280° TO NUMBER 1 PISTON TDC
1. Allen key 14 mm

3.1 The front piston is at TDC when it's index mark on the magneto flywheel is aligned with the notch in the magneto cover.



CYLINDER 1 AT TDC
1. Number 1 piston identifier
2. Index mark "1" on magneto flywheel
3. Notch on magneto cover
4. Crankshaft position sensor bore

3.2 Confirm printed marks on the camshaft timing gear are parallel with cylinder head base, in the lowest position. In this position the piston is set to **TDC ignition**.



TYPICAL - PISTON AT TDC IGNITION
1. Printed marks on camshaft timing gear
2. Cylinder head base

4. Insert the crankshaft TDC position tool to lock crankshaft in position. Refer to *CRANKSHAFT TDC POSITION TOOL INSTALLATION* in this subsection.

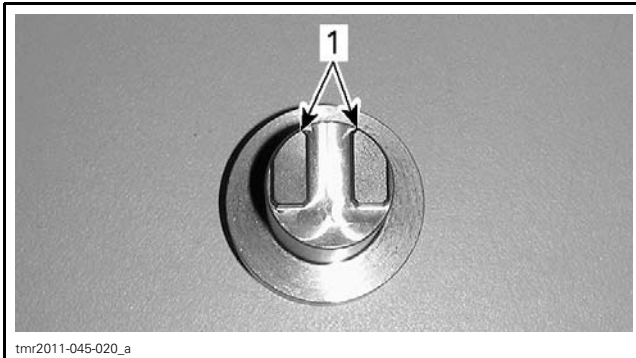
Crankshaft TDC Position Tool Installation

NOTICE Never use crankshaft TDC position tool to remove or tighten drive CVT screw or rotor retaining screw. Damage to the teeth of the trigger wheel on the rotor will occur.

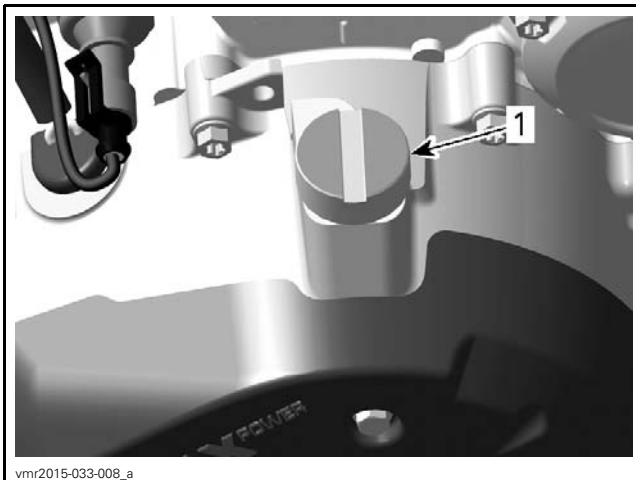
Install tool in magneto cover CPS bore.

REQUIRED TOOL	
CRANKSHAFT TDC POSITION TOOL (P/N 529 036 201)	

NOTE: Make sure to match the teeth on the crankshaft TDC position tool with the magneto rotor.



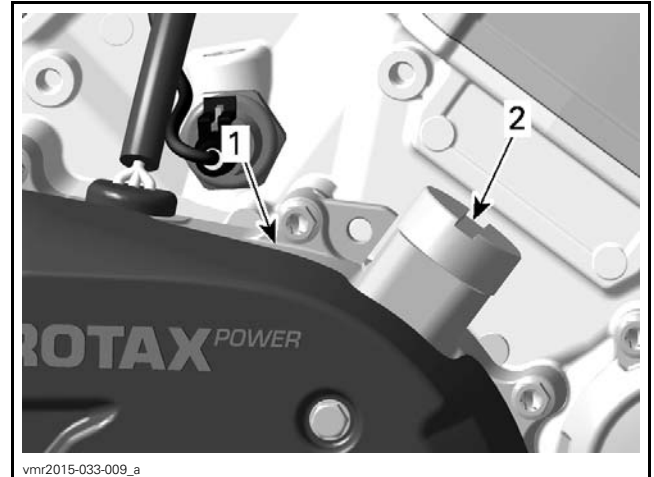
1. Crankshaft TDC position tool teeth (end view)



MAGNETO COVER

1. Crankshaft TDC position tool installed in CPS bore

NOTICE Tool must be fully inserted.



1. Magneto cover
2. TDC position tool

TIMING CHAIN

Timing Chain Location

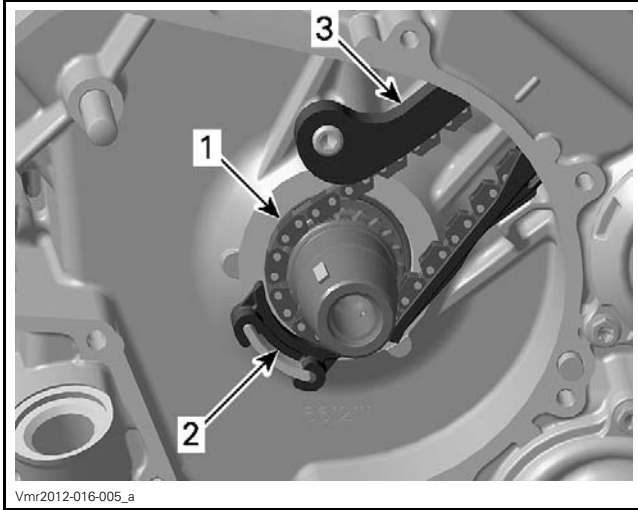
The engine is equipped with two timing chains.

- MAG side timing chain is located behind the magneto cover.
- PTO side timing chain is located behind the PTO cover.

Removing the Timing Chain (MAG Side)

1. Refer to *MAGNETO AND STARTER* subsection and remove following parts:
 - Magneto cover
 - Rotor
 - Sprag clutch gear.
2. Refer to *TOP END* subsection and remove the following part:
 - Valve cover.
3. Refer to following procedures in this subsection and remove following parts:
 - Chain tensioner
 - Camshaft timing gear.
4. Remove timing chain guide (tensioner side) and lower timing chain guide.

Subsection 09 (TIMING CHAIN)



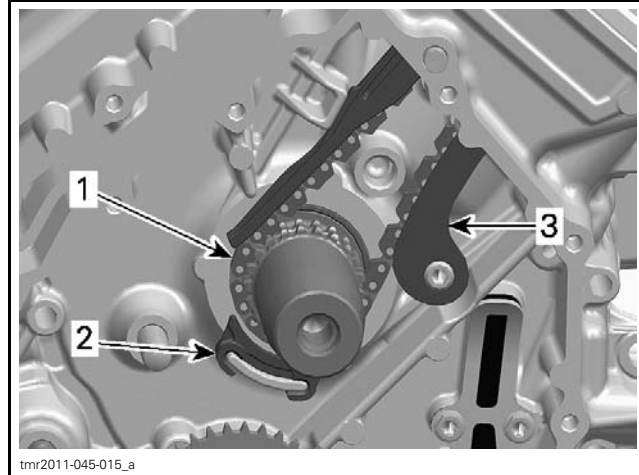
1. Timing chain
2. Lower timing chain guide
3. Timing chain guide (tensioner side)

NOTE: Mark the operating direction of the timing chain and check for excessive radial play before removal. Refer to *TIMING CHAIN INSPECTION*.

5. Carefully pull the timing chain downwards and sideways, then out of the crankcase.

Removing the Timing Chain (PTO Side)

1. Refer to *BOTTOM END* subsection and remove following parts:
 - PTO cover
 - Breather gear
 - Intermediate gear.
2. Refer to *TOP END* subsection and remove following part:
 - Valve cover.
3. Refer to applicable procedures in this subsection and remove following parts:
 - Chain tensioner
 - Camshaft timing gear.
4. Remove timing chain guide (tensioner side) and lower timing chain guide.



1. Timing chain
2. Lower timing chain guide
3. Timing chain guide (tensioner side)

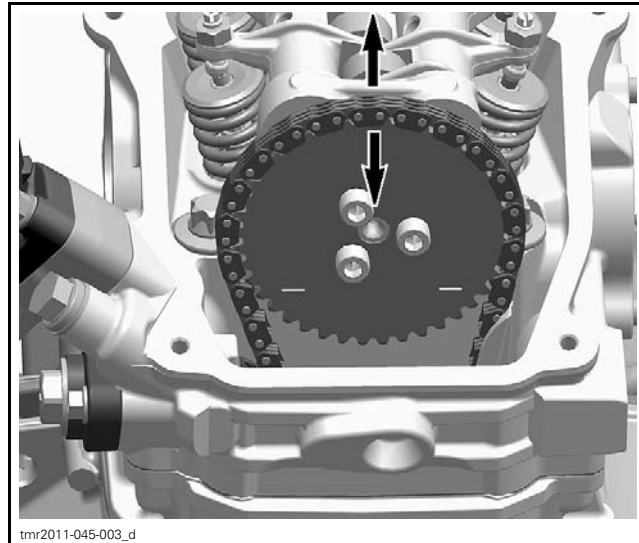
NOTE: Mark the operating direction of the timing chain and check for excessive radial play before removal. Refer to *TIMING CHAIN INSPECTION*.

5. Carefully pull the timing chain sideways and down from the crankcase.

Inspecting the Timing Chain

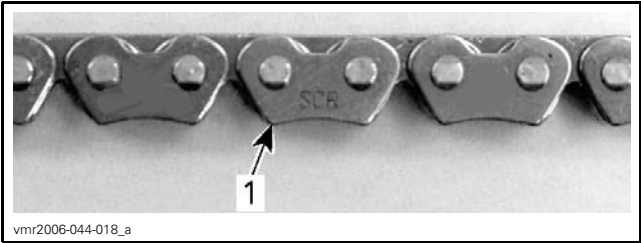
Inspection is the same for both timing chains.

Check timing chain on camshaft timing gear for excessive radial play.



CHECKING TIMING CHAIN RADIAL PLAY

Check chain condition for wear and teeth condition.



1. Timing chain

If chain is excessively worn or damaged, replace it as a set (camshaft timing gear and timing chain). Check timing chain guides for wear, cracks or deformation. Replace as required.

NOTE: Check also the timing chain guide (tensioner side).

Installing the Timing Chain

The installation is essentially the reverse of the removal procedure however, pay attention to the following details.

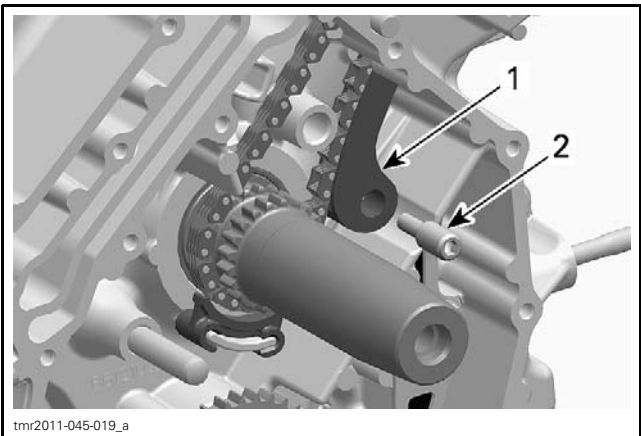
NOTE: Installation is the same for both timing chains.

Install timing chain with camshaft timing gear.

NOTE: Ensure to carry out proper valve timing, refer to *CAMSHAFT TIMING GEARS* in this subsection.

NOTICE Improper valve timing will damage engine components.

TIMING CHAIN GUIDE (TENSIONER SIDE)



1. Timing chain guide (tensioner side)
2. Bearing screw

Removing the Timing Chain Guide (Tensioner Side)

Refer to *TIMING CHAIN* in this subsection.

Inspecting the Timing Chain Guide (Tensioner Side)

Check timing chain guide for wear, cracks or deformation. Replace if necessary.

Installing the Timing Chain Guide (Tensioner Side)

The installation is the reverse of the removal procedure.

TIGHTENING TORQUE	
Service product	LOCTITE 243 (BLUE) (P/N 293 800 060)
Timing chain guide bearing screw	10 N•m ± 1 N•m (89 lbf•in ± 9 lbf•in)