

# Brief Engine Knock/Rattle Noise at Cold Startup (1AR/2AR)

Service  
Category Engine/Hybrid System

Section Engine Mechanical

Market USA

Toyota Supports  
ASE Certification 

## Applicability

YEAR(S)	MODEL(S)	ADDITIONAL INFORMATION
2010 – 2012	Camry	VDS(s): BF1FK, BF3EK WMI(s): 4T1, 4T4, JTN
2009 – 2013	Highlander	VDS(s): DA41A, ZA3EH WMI(s): 5TD
2009 – 2012	RAV4	VDS(s): BF31V, BF32V, BF33V, BF34V, BF35V, BF4DV, BF9DV, DF4DV, DF9DV, EF4DV, JF4DV, KF4DV, KF9DV, RF4DV, WF4DV, XF4DV, YF4DV, YK9DV, ZF31V, ZF32V, ZF33V, ZF34V, ZF35V, ZF4DV, ZF9DV WMI(s): 2T3, JTM
2011 – 2013	Sienna	VDS(s): KA3DC WMI(s): 5TD
2009 – 2013	Venza	VDS(s): BA3BB, BE11A, ZA3BB WMI(s): 4T3

### SUPERSESION NOTICE

The information contained in this bulletin supersedes SB No. T-SB-0146-10.

- Applicability has been updated to include 2012 – 2013 model year vehicles.

Service Bulletin No. T-SB-0146-10 is Obsolete and any printed versions should be discarded. Be sure to review the entire content of this bulletin before proceeding.

## Introduction

Immediately following a cold soak startup, some 2009 – 2013 model year vehicles equipped with the 1AR-FE and 2AR-FE engines may exhibit a brief knock/rattle noise from the engine compartment for approximately one second. Follow the repair procedure below to address this condition.

## Brief Engine Knock/Rattle Noise at Cold Startup (1AR/2AR)

### Production Change Information

This bulletin applies to:

- All 2010 – 2012 MY Tsutsumi produced Camry vehicles.
- Vehicles produced **BEFORE** the Production Change Effective VINs shown below.

MODEL	PLANT	DRIVETRAIN	PRODUCTION CHANGE EFFECTIVE VIN
Camry	TMMK Line 1	2WD	4T1BF1FK#CU193768
	TMMK Line 2		4T1BF1FK#CU631600
	SIA		4T4BF1FK#CR267530
Highlander	TMMI		5TDKA3DC#DS016895
RAV4	Shokki	2WD	JTMZF4DV#BD031671
		4WD	JTMBF4DV#BD043071
	Tahara	2WD	JTMWF4DV#B5042326
		4WD	JTMRF4DV#B5048712
	TMMC	2WD	2T3YF4DV#CW153020
		4WD	2T3BF4DV#CW264373
Sienna	TMMI	2WD	5TDZA3EH#DS035562
Venza	TMMK	2WD	4T3ZA3BB#DU070721
		4WD	4T3BA3BB#DU039056

### Warranty Information

OP CODE	DESCRIPTION	MODEL	MODEL YEAR	TIME	OFF	T1	T2
140021	R & R Camshaft Timing Gear Assembly	Camry	2010 – 2012	2.6	13050-0V010	06	40
		Highlander	2009 – 2013	2.6			
		RAV4	2009 – 2012	2.4			
		Sienna	2011 – 2013	2.8			
		Venza	2009 – 2013	2.7			

#### APPLICABLE WARRANTY

- This repair is covered under the Toyota Powertrain Warranty. This warranty is in effect for 60 months or 60,000 miles, whichever occurs first, from the vehicle's in-service date.
- Warranty application is limited to occurrence of the specified condition described in this bulletin.

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### Parts Information

MODEL	PREVIOUS PART NUMBER	CURRENT PART NUMBER	PART NAME	QTY
Camry	13050-0V010 13050-0V011 13050-36010 13050-36011 13050-0V030	13050-0V040	Gear Assembly, Camshaft Timing	1
Highlander				1
RAV4 (from April '11)				1
Sienna				1
Venza				1
RAV4 (from '09 MY until end of March '11)				13050-0V010 13050-36010 13050-36011
ALL	11213-36020	Same	Gasket, Cylinder Head Cover	1
	11159-36010 11159-36011 11159-0V010	11159-0V011	Gasket, Camshaft Bearing Cap Oil Hole No. 1	2
	90430-10024	90430-A0001	Gasket, Camshaft Bearing Cap Oil Hole No. 2	1
	11328-36020	11328-0V010	Gasket, Timing Chain Tensioner	1
	11329-36010	Same	Gasket, Timing Chain Cover, No. 2	1
	13552-36010	13552-0V010	Gasket (for Chain Tensioner)	1

## Brief Engine Knock/Rattle Noise at Cold Startup (1AR/2AR)

### Required Tools & Equipment

REQUIRED EQUIPMENT	SUPPLIER	PART NUMBER	QTY
Techstream 2.0*	ADE	TS2UNIT	1
TIS Techstream		TSPKG1	
Techstream Lite		TSLITEDLR01	

SPECIAL SERVICE TOOLS (SST)	PART NUMBER	QTY
Torque Wrench Adapter*	<u>09249-63010-01</u>	1

REQUIRED MATERIALS	QTY
FIPG Sealant: Three Bond 1207B, or Equivalent	As Needed

**NOTE**

- Only **ONE** of the Techstream units listed above is required.
- Software version 8.00.034 or later is required.
- Additional Techstream units may be ordered by calling Approved Dealer Equipment (ADE) at 1-800-368-6787.
- Additional SSTs may be ordered by calling 1-800-933-8335.

\* Essential SST.

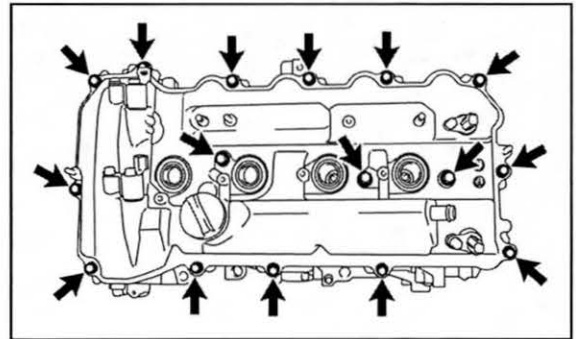
## Brief Engine Knock/Rattle Noise at Cold Startup (1AR/2AR)

### Repair Procedure

1. Confirm the brief knock/rattle noise condition. See attached video for an example of the engine knock/rattle noise:  
[Engine Knock/Rattle Noise Example \(1AR/2AR\)](#)

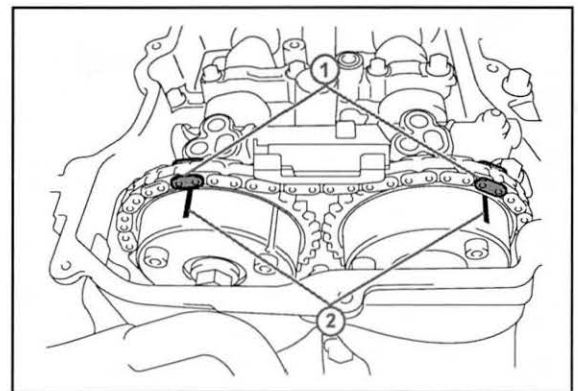
2. Remove the cylinder head cover.
  - A. Relocate the engine harness that lies across the top of the cylinder head cover.
  - B. Remove the ignition coils.
  - C. Remove the 16 bolts and cylinder head cover.

Figure 1.



3. Remove the chain tensioner.
  - A. Remove the right front wheel.
  - B. Remove the front fender apron seal RH.
  - C. Remove the V-ribbed belt for the vane pump.
  - D. Rotate the crankshaft clockwise and set the No. 1 cylinder at +10° from the TDC/compression.
  - E. After the timing marks are aligned on the VVT gear, place paint marks on the chain and both gears.

Figure 2.



1	Paint Marks
2	Timing Marks

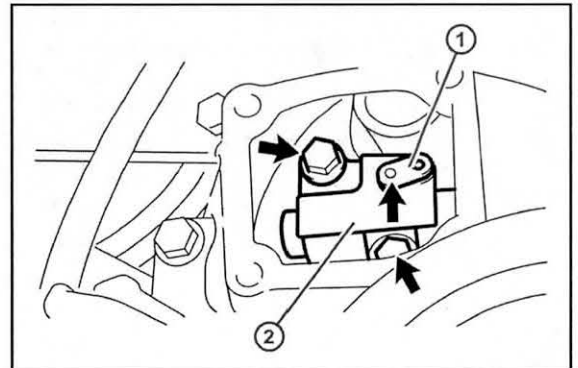
## Brief Engine Knock/Rattle Noise at Cold Startup (1AR/2AR)

### Repair Procedure (Continued)

- F. Rotate the crankshaft counterclockwise by 10° and loosen the tension of the chain.
- G. Remove the timing chain cover plate.

- H. Align the holes of the stopper plate and tensioner, and insert a pin into the stopper plate hole to lock the tensioner.

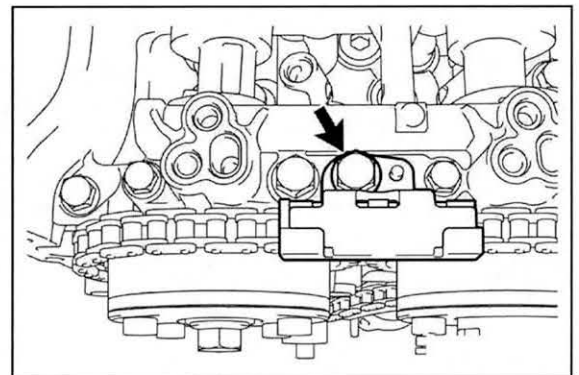
Figure 3.



1	Stopper Plate
2	Timing Tensioner

- I. Remove the 2 bolts and chain tensioner.
- 4. Remove the timing chain guide by removing the bolt.

Figure 4.



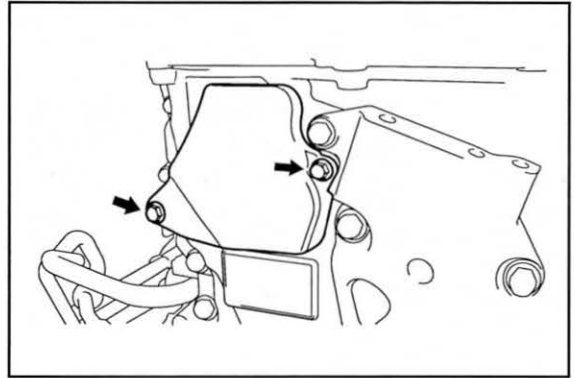
## Brief Engine Knock/Rattle Noise at Cold Startup (1AR/2AR)

### Repair Procedure (Continued)

5. Remove the intake side VVT gear.

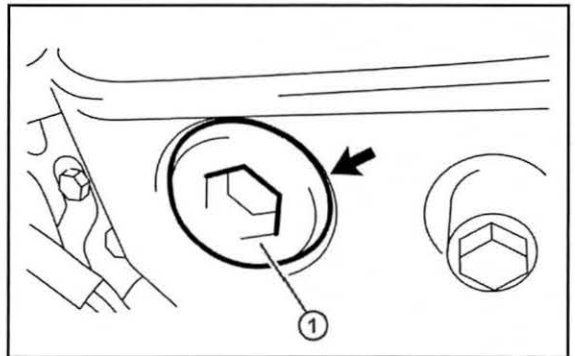
- A. For Camry ONLY:  
Remove the 2 bolts and the No. 2 timing chain cover.

Figure 5.



B. Remove the service hole plug.

Figure 6.



1	Service Hole Plug
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## Brief Engine Knock/Rattle Noise at Cold Startup (1AR/2AR)

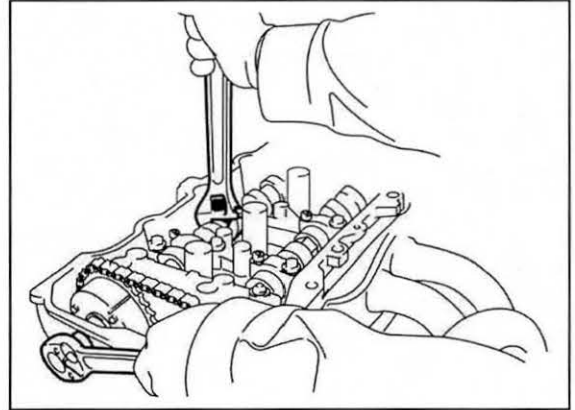
### Repair Procedure (Continued)

- C. Insert the tool through the service hole and remove the bolt of the intake VVT gear while holding the camshaft stationary with a wrench.

#### NOTICE

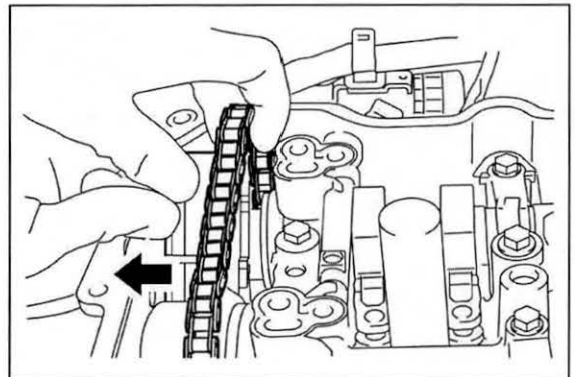
- Be careful **NOT** to damage the cylinder head or spark plug tube with the wrench.
- Do **NOT** disassemble the camshaft timing gear.

Figure 7.



- D. After the VVT gear is slid in the arrow direction as shown in Figure 8, lower the VVT gear and remove the chain from the VVT gear.

Figure 8.





## Brief Engine Knock/Rattle Noise at Cold Startup (1AR/2AR)

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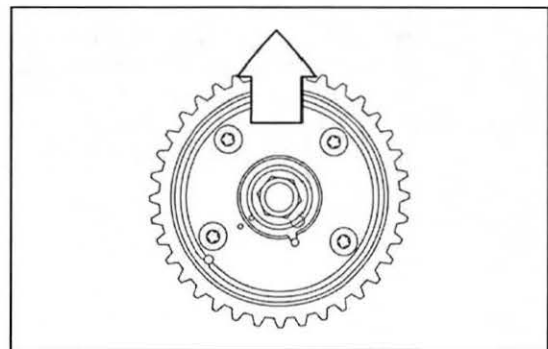
### Repair Procedure (Continued)

- E. Remove the VVT gear from the cam housing.
- F. Tie the timing chain to ensure it stays properly aligned with the exhaust and crankshaft timing gear pulleys.

#### NOTICE

The VVT gear bolts may interfere with the housing during removal. After the VVT gear slides out from the camshaft, carefully rotate the VVT gear to the position shown in Figure 9 to avoid interference and remove it in the arrow direction shown.

Figure 9.



## Brief Engine Knock/Rattle Noise at Cold Startup (1AR/2AR)

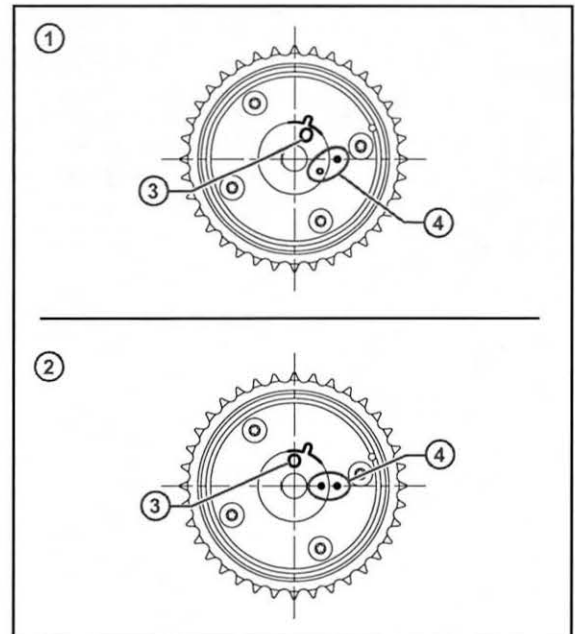
### Repair Procedure (Continued)

6. Install the intake side VVT gear.
  - A. Transfer the paint marks from the old gear to the new gear.
  - B. Confirm the new gear is in the unlocked position prior to installation.

**NOTE**

The camshaft timing gear **MUST** be in the unlocked position when installing on the camshaft to prevent damage to the lock pin during tightening. Please see step E for instructions to unlock the camshaft timing gear.

Figure 10.



1	Advanced (Unlocked) Position
2	Retarded (Locked) Position
3	Knock Pin Hole
4	Alignment Mark

- C. Remove the tie from the timing chain.

## Brief Engine Knock/Rattle Noise at Cold Startup (1AR/2AR)

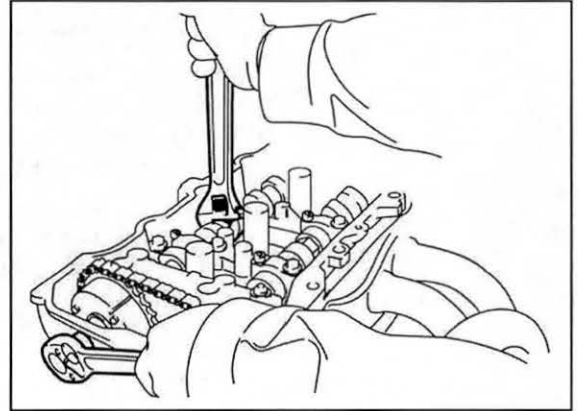
### Repair Procedure (Continued)

- D. Insert the tool from the service hole and install the bolt of the intake VVT gear.

Figure 11.

**NOTICE**

Make sure **NOT** to lock the camshaft timing gear. If the camshaft timing gear is locked, release the lock according to the following procedure (step E).



- E. Inspect the camshaft timing gear lock.

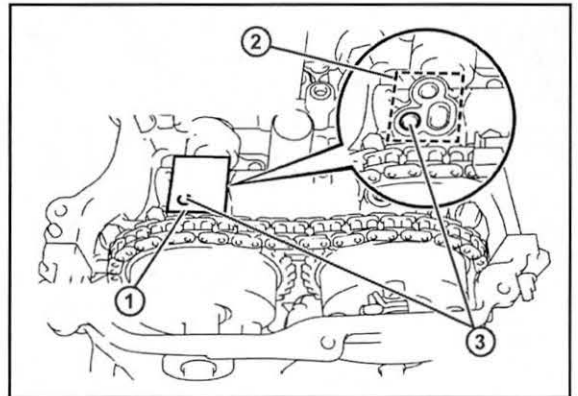
If the camshaft timing gear is locked, release the lock according to the following procedure.

- (1) After cleaning and degreasing the intake side VVT oil hole on the No. 1 camshaft bearing cap, completely seal the oil hole with adhesive tape or equivalent as shown in Figure 12 to prevent air from leaking.

Figure 12.

**NOTICE**

Be sure to seal the oil hole completely because air leaks due to insufficient sealing will prevent the lock pin from being released.



1	Adhesive Tape
2	Adhesive Tape Sealing Area
3	Poke a Hole

- (2) Make a hole in the adhesive tape covering the oil hole as shown in Figure 12.

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Repair Procedure (Continued)

- (3) Apply approximately 200 kPa (2.0 kgf/cm<sup>2</sup>, 29 psi) of air pressure to the hole made in the preceding step, then forcibly turn the camshaft timing gear assembly in the advance direction (counterclockwise).

**CAUTION**  
 Cover the oil passages with a piece of cloth when applying pressure to keep oil from splashing.

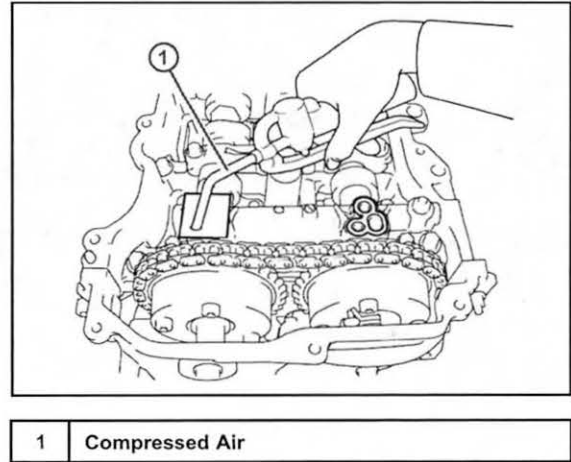
**NOTICE**

- If air leaks out, reattach the adhesive tape.
- Do NOT allow the camshaft timing gear assembly to lock. If it locks, release the lock pin again.

**HINT**

- The camshaft timing gear assembly may be turned in the advance direction without applying any force.
- If enough air pressure cannot be applied because of air leakage from the port, releasing the lock pin may be difficult.

Figure 13.



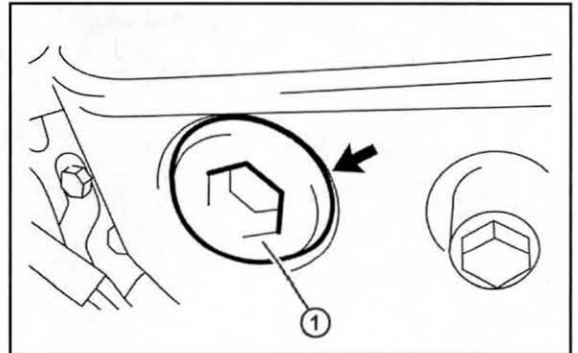
- (4) Remove the adhesive tape on the VVT hole.
- F. Tighten the bolt of the intake VVT gear.  
 Torque: 85 N\*m (867 kgf\*cm, 63 ft\*lbf)
- G. Lock the gear by rotating the camshaft timing gear assembly clockwise.

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### Repair Procedure (Continued)

7. Install the service hole plug with a new gasket.  
Torque: 30 N\*m (306 kgf\*cm, 22 ft\*lbf)

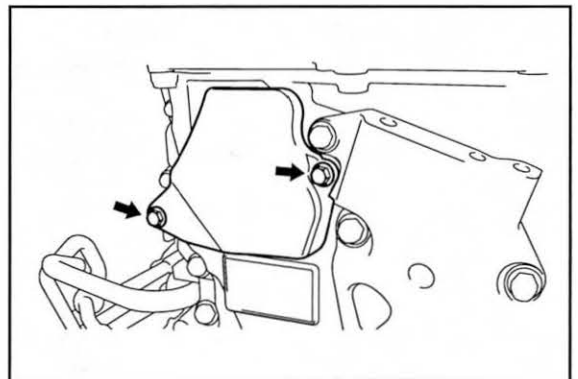
Figure 14.



1	Service Hole Plug
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8. For Camry ONLY:  
Install the No. 2 timing chain cover with the 2 bolts.  
Torque: 10 N\*m (102 kgf\*cm, 7 ft\*lbf)

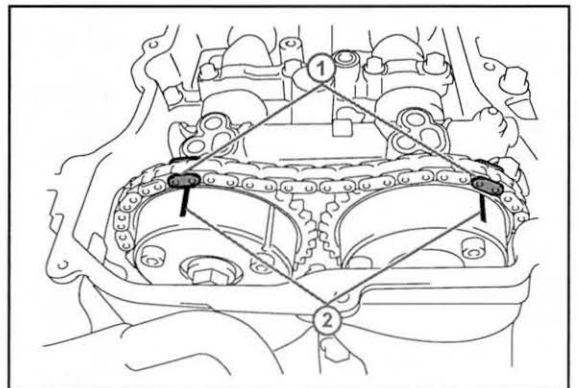
Figure 15.



9. Install the chain to the VVT gear.

**NOTICE**  
Align the marks that were placed on the gears and chain.

Figure 16.



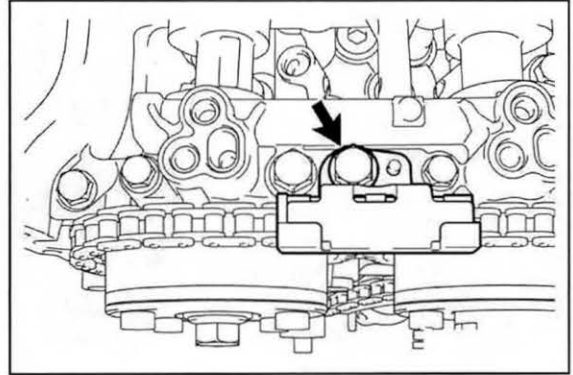
1	Paint Marks
2	Timing Marks

## Brief Engine Knock/Rattle Noise at Cold Startup (1AR/2AR)

### Repair Procedure (Continued)

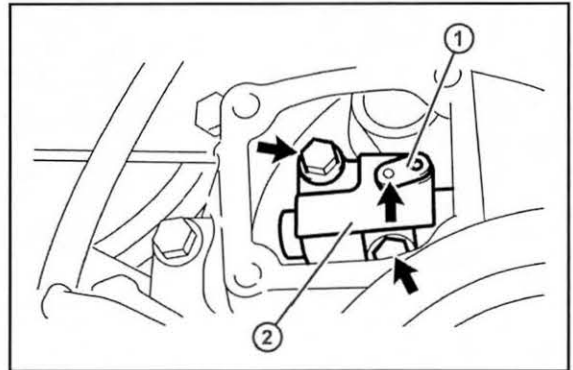
10. Install the timing chain guide with the bolt.  
**Torque: 21 N\*m (214 kgf\*cm, 15 ft\*lbf)**

Figure 17.



11. Install the chain tensioner.
- A. Install a new gasket and the chain tensioner to the service hole.  
**Torque: 10 N\*m (102 kgf\*cm, 7 ft\*lbf)**
  - B. When installing the tensioner, pull out the pin and release the tensioner.
  - C. Install the timing chain cover plate.  
 Install a new gasket and the timing chain cover plate with the 4 bolts.  
**Torque: 10 N\*m (102 kgf\*cm, 7 ft\*lbf)**

Figure 18.



1	Stopper Plate
2	Timing Tensioner

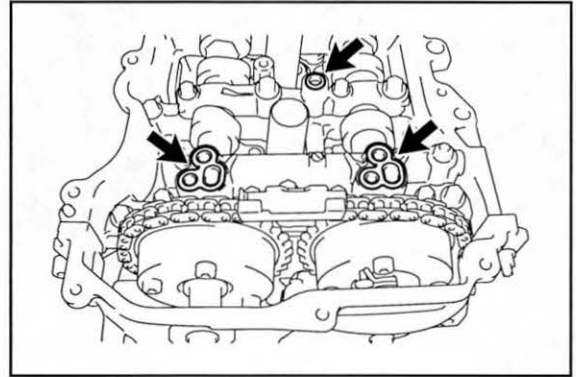
12. Install the cylinder head cover sub-assembly.
- A. Apply a light coat of engine oil to 3 new gaskets.

## Brief Engine Knock/Rattle Noise at Cold Startup (1AR/2AR)

### Repair Procedure (Continued)

- B. Install the 3 gaskets to the camshaft bearing caps.

Figure 19.



- C. Install a new gasket to the cylinder head cover.

**NOTICE**

Remove any oil from the contact surface.

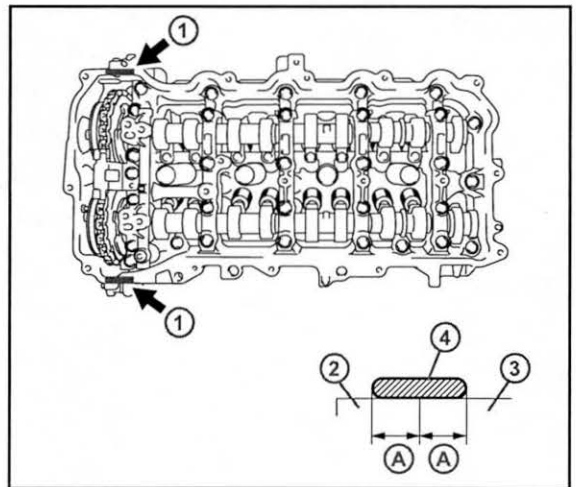
- D. Apply FIPG sealant as shown in Figure 20.

Figure 20.

**FIPG Sealant: Three Bond 1207B, or equivalent**  
**Standard Seal Diameter: 3.0 to 6.0 mm (0.118 to 0.236 in.)**  
**Application Width A: 5.0 mm (0.197 in.)**

**NOTICE**

- Remove any oil from the contact surface.
- Install the cylinder head cover within 3 minutes and tighten the bolts within 15 minutes after applying FIPG sealant.



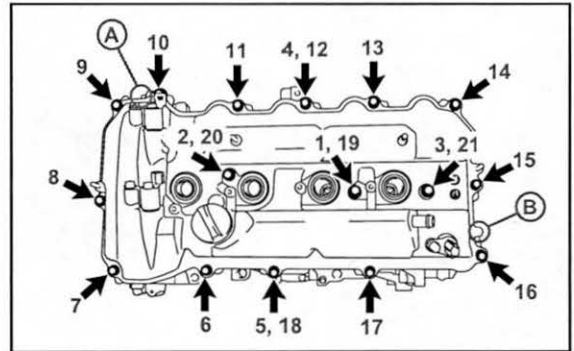
1	FIPG Sealant
2	Timing Chain Cover
3	Camshaft Housing
4	3.0 to 6.0 mm
A	Application Width "A"

## Brief Engine Knock/Rattle Noise at Cold Startup (1AR/2AR)

### Repair Procedure (Continued)

- E. Align the cylinder head cover with pin A.  
Then align the cylinder head cover with pin B  
and install the cylinder head cover.

Figure 21.



A	Pin A
B	Pin B

- F. Install the 16 bolts and then tighten the bolts in the order shown in Figure 21.  
**Torque: 12 N\*m (122 kgf\*cm, 9 ft\*lbf)**

**NOTICE**

**Do NOT apply oil for at least 4 hours after the installation.**

13. Confirm the repair.