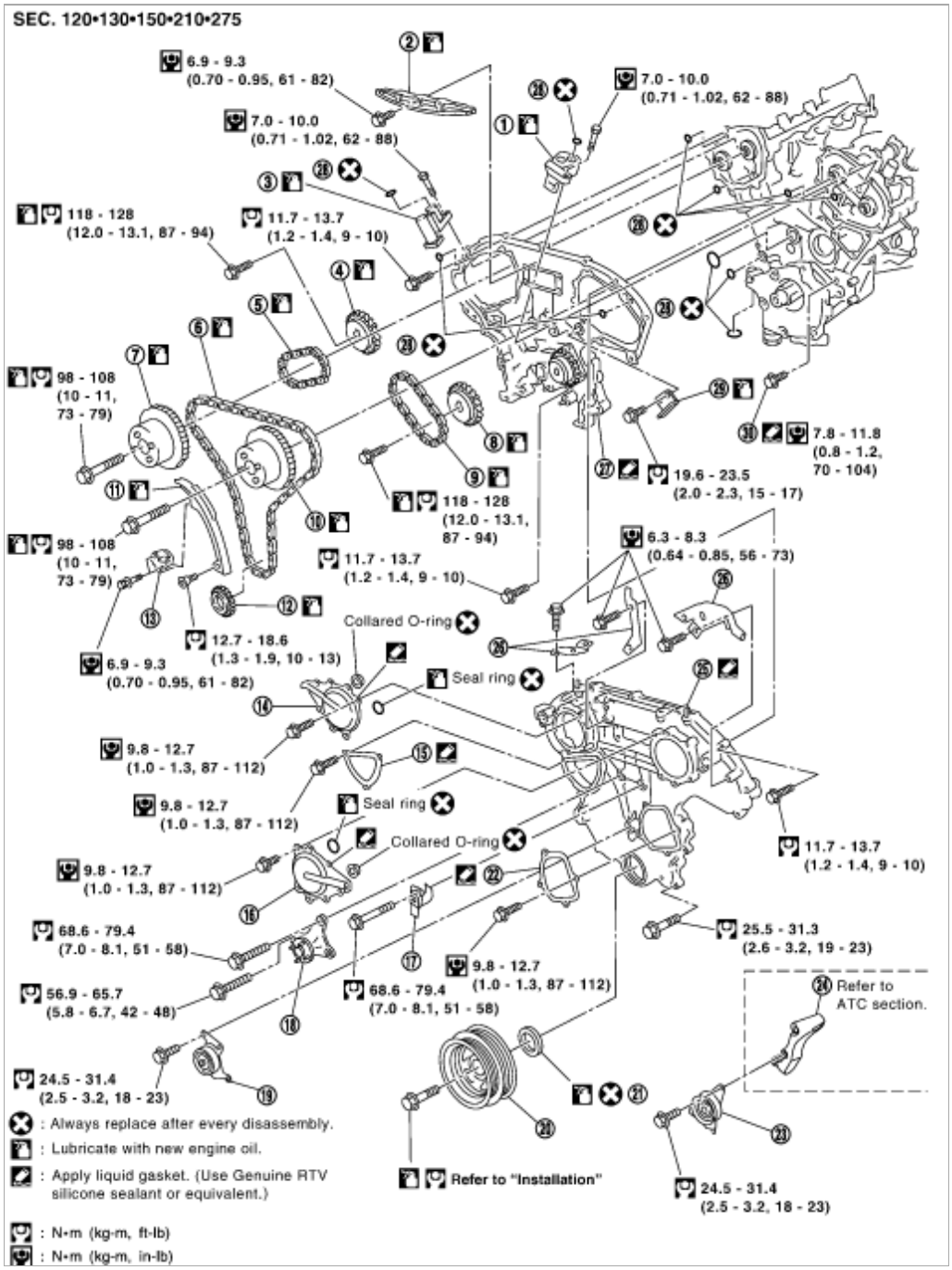
2003 Infiniti G35 Sedan V6-3.5L (VQ35DE)

Vehicle » Engine, Cooling and Exhaust » Engine » Timing Chain » Service and Repair

Part 1



Part 2

1.	Timing chain tensioner (secondary)	2.	Internal chain guide	3.	Timing chain tensioner (secondary)
4.	Camshaft sprocket (EXH)	5.	Timing chain (secondary)	6.	Timing chain (primary)
7.	Camshaft sprocket (INT)	8.	Camshaft sprocket (EXH)	9.	Timing chain (secondary)
10.	Camshaft sprocket (INT)	11.	Slack guide	12.	Crankshaft sprocket
13.	Timing chain tensioner (primary)	14.	Intake valve timing control cover	15.	Chain tensioner cover
16.	Intake valve timing control cover	17.	Water hose clamp	18.	Idler pulley bracket
19.	Idler pulley	20.	Crankshaft pulley	21.	Front oil seal
22.	Water pump cover	23.	Idler pulley	24.	A/C compressor bracket
25.	Front timing chain case	26.	Bracket	27.	Rear timing chain case
28.	O-ring	29.	Tension guide	30.	Water drain plug

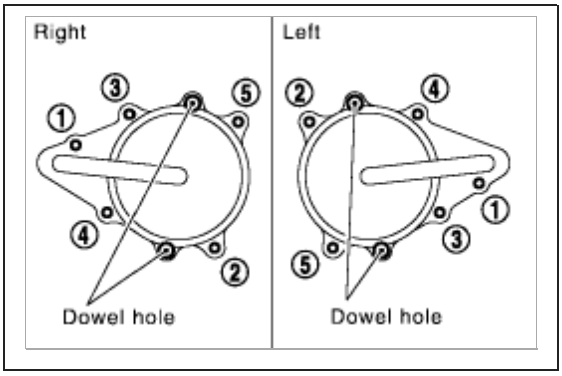
TIMING CHAIN
Removal and Installation

NOTE:

- This section describes procedures for removing/installing front timing chain case and timing chain related parts, and rear timing chain case, when oil pan (upper) needs to be removed/installed for engine overhaul, etc.
- To remove/install front timing chain case, timing chain, and its related parts without removing oil pan (upper), refer to "FRONT TIMING CHAIN CASE".

REMOVAL

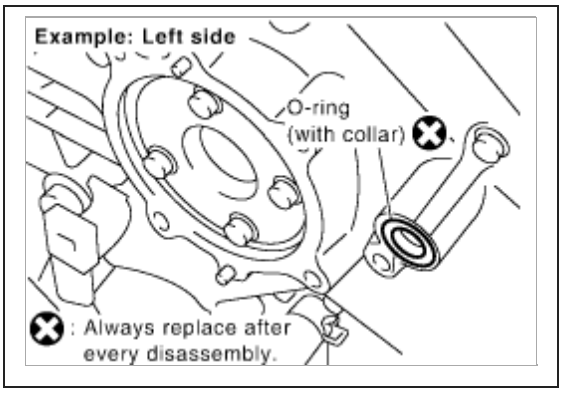
1. Remove engine cover with power tool. Refer to "INTAKE MANIFOLD COLLECTOR".
2. Remove air cleaner case assembly. Refer to "AIR CLEANER AND AIR DUCT".
3. Remove undercover with power tool.
4. Drain engine coolant from radiator. Refer to "Changing Engine Coolant".
5. Drain engine oil. Refer to "Changing Engine Oil".
6. Separate engine harnesses removing their brackets from front timing chain case.
7. Remove intake manifold collectors (upper and lower) with power tool. Refer to "INTAKE MANIFOLD COLLECTOR".
8. Remove radiator cooling fan assembly. Refer to "COOLING FAN".
9. Remove drive belts. Refer to "DRIVE BELTS".
10. Remove A/C compressor from bracket with piping connected, and temporarily secure it aside. Refer to "Components".
11. Remove power steering oil pump from bracket with piping connected, and temporarily secure it aside. Refer to "POWER STEERING OIL PUMP".
12. Remove power steering oil pump bracket. Refer to "POWER STEERING OIL PUMP".
13. Remove alternator. Refer to "CHARGING SYSTEM".
14. Remove water bypass hose, water hose clamp and idler pulley bracket from front timing chain case.



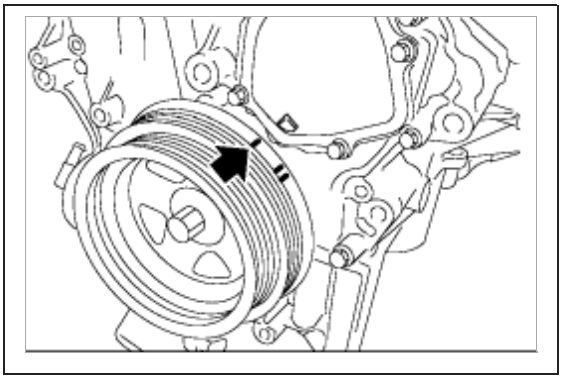
15. Remove right and left intake valve timing control covers.

- Loosen bolts in reverse order as shown in the figure.
- Use seal cutter [SST: KV10111100 (J-37228)] or equivalent tool to cut liquid gasket for removal.

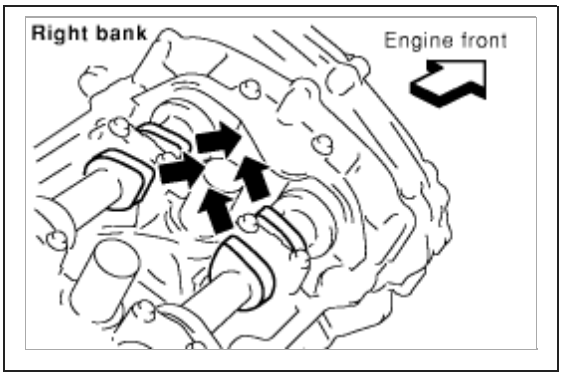
CAUTION: Shaft is internally jointed with intake camshaft sprocket center hole. When removing, keep it horizontal until it is completely disconnected.



16. Remove collared O-ring from front timing chain case (left and right side).
17. Remove rocker covers (right and left banks) with power tool. Refit
18. Obtain compression TDC of No. 1 cylinder as follows:



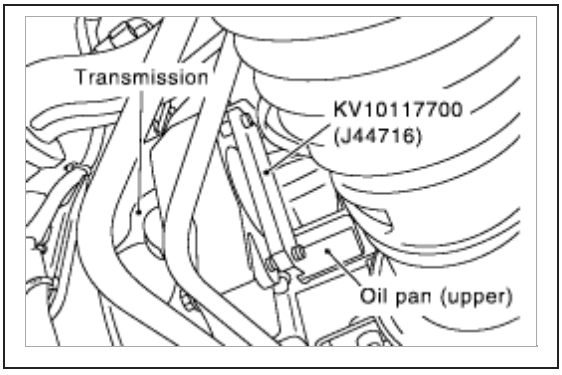
a. Rotate crankshaft pulley clockwise to align timing mark (grooved line without color) with timing indicator.



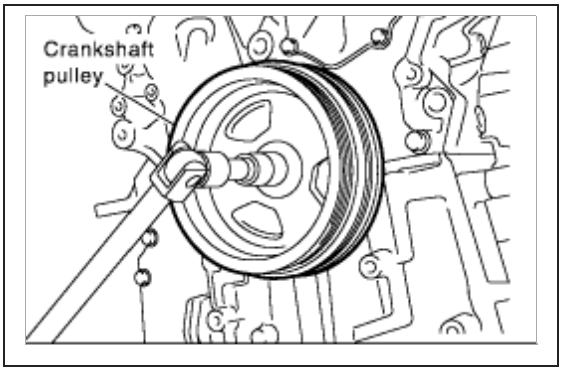
b. Make sure that intake and exhaust cam noses on No. 1 cylinder (engine front side of right bank) are located as shown in the figure.

- If not, turn crankshaft **one revolution (360 degrees)** and align as shown in the figure.

19. Remove crankshaft pulley as follows:

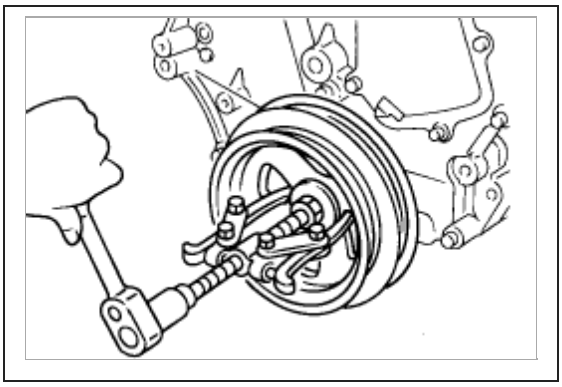


a. Remove starter motor and set ring gear stopper (SST) as shown in the figure. Refer to "STARTING SYSTEM".



b. Loosen crankshaft pulley bolt and locate bolt seating surface at **10 mm (0.39 inch)** from its original position.

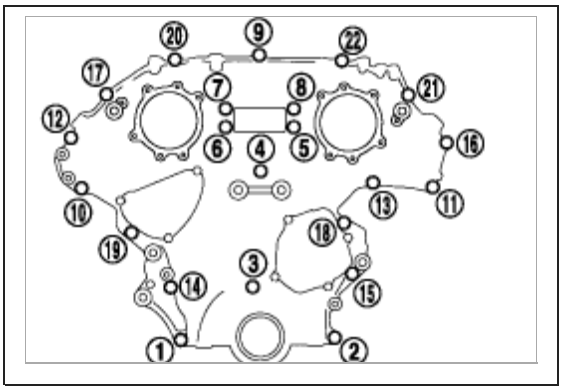
CAUTION: Do not remove crankshaft pulley bolt as it will be used as a supporting point for suitable puller.



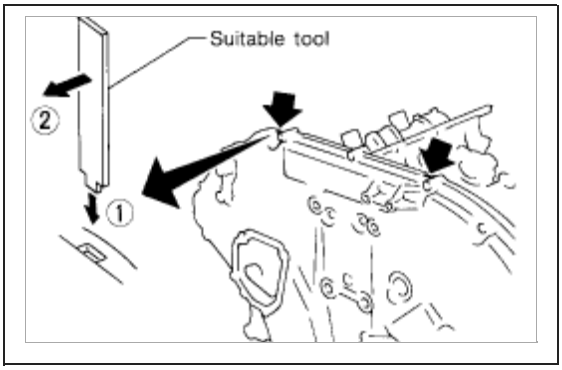
c. Place suitable puller tab on holes of crankshaft pulley, and pull crankshaft pulley through.

CAUTION: Do not put suitable puller tab on crankshaft pulley periphery, as this will damage internal damper.

20. Remove oil pans (upper and lower). Refer to "OIL PAN AND OIL STRAINER".
21. Remove front timing chain case as follows:



a. Loosen mounting bolts in reverse order as shown in the figure.

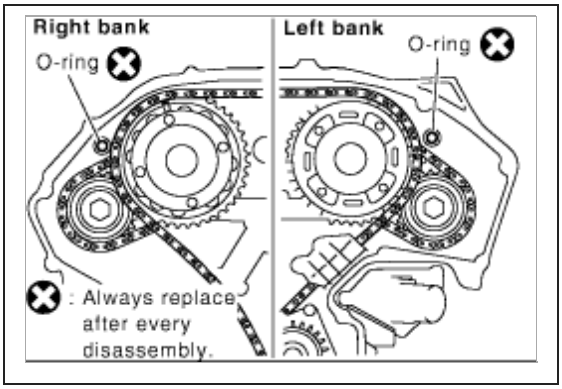


b. Insert suitable tool into the notch at the top of the front timing chain case as shown (1).
c. Pry off case by moving the tool as shown (2).

- Use seal cutter [SST: KV10111100 (J-37228)] or equivalent tool to cut liquid gasket for removal.

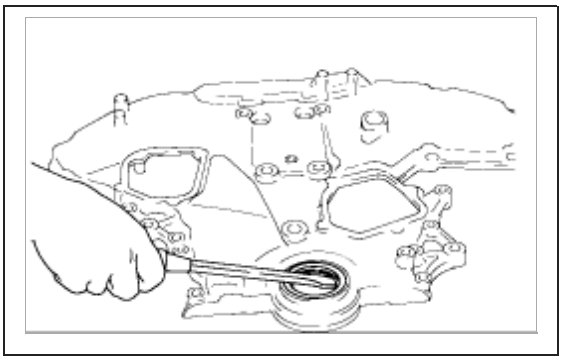
CAUTION:

- Do not use flat-bladed screwdriver or something similar.
- After removal, handle front timing chain case carefully so it does not tilt, cant, or warp under a load.



22. Remove O-rings from rear timing chain case.
23. Remove water pump cover and chain tensioner cover from front timing chain case.

- Use seal cutter [SST: KV10111100 (J-37228)] or equivalent tool to cut liquid gasket for removal.

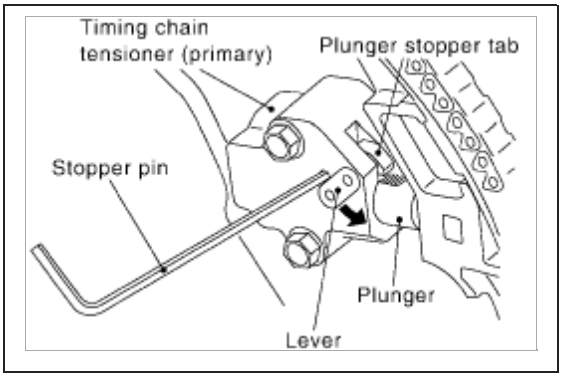


24. Remove front oil seal from front timing chain case using suitable tool.

- Use flat-bladed screwdriver for removal.

CAUTION: Be careful not to damage front timing chain case.

25. Remove timing chain tensioner (primary) as follows:

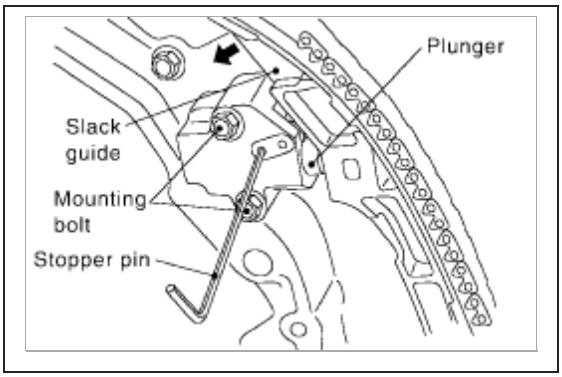


a. Pull lever down and release plunger stopper tab.

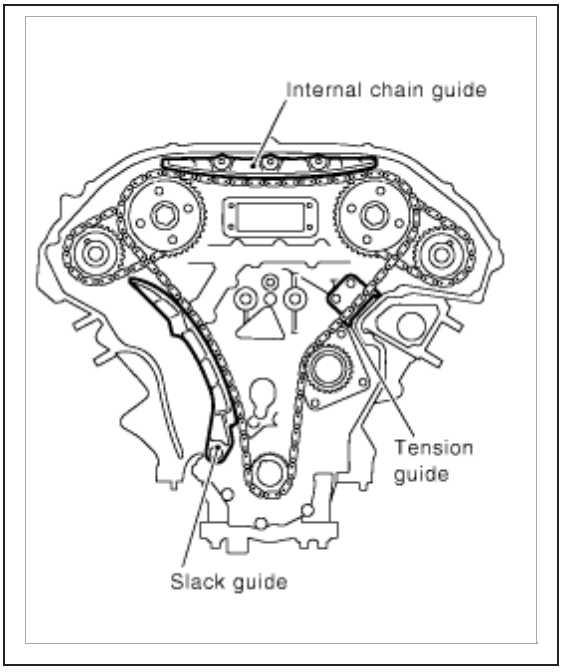
- Plunger stopper tab can be pushed up to release (coaxial structure with lever).

b. Insert stopper pin into tensioner body hole to hold lever, and keep tab released.

NOTE: Allen wrench [2.5 mm (0.098 inch)] is used for a stopper pin as an example.



c. Insert plunger into tensioner body by pressing slack guide.
d. Keep slack guide pressed and hold it by pushing stopper pin through the lever hole and body hole.
e. Remove mounting bolts and remove timing chain tensioner (primary).



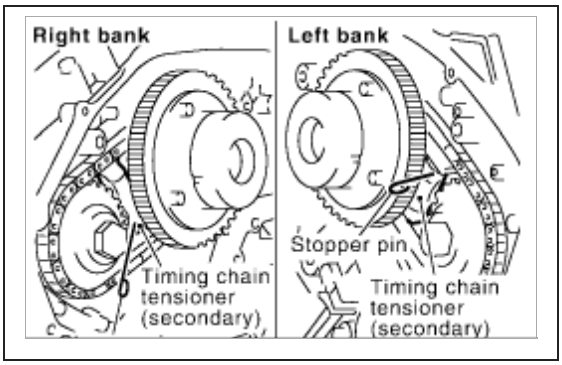
26. Remove internal chain guide, tension guide and slack guide.

NOTE: Tension guide can be removed after removing timing chain (primary).

27. Remove timing chain (primary) and crankshaft sprocket.

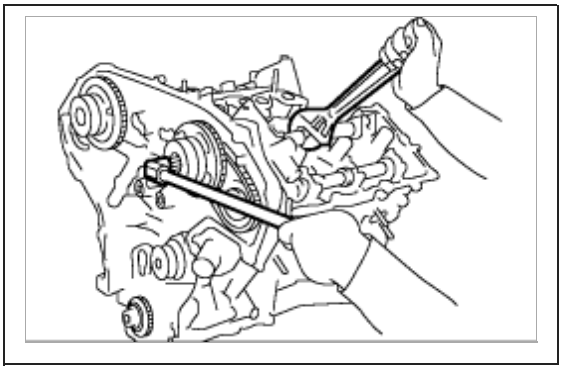
CAUTION: After removing timing chain (primary), do not turn crankshaft and camshaft separately, or valves will strike the piston heads.

28. Remove timing chain (secondary) and camshaft sprockets as follows:



a. Attach suitable stopper pin to the right and left timing chain tensioners (secondary).

NOTE: For removal of timing chain tensioner (secondary), refer to "CAMSHAFT". [Removing camshaft bracket (No. 1) is required.]

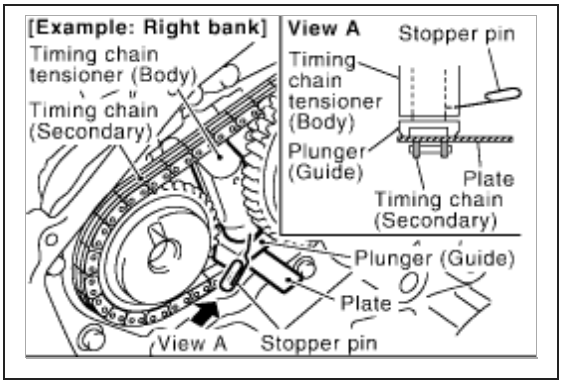


b. Remove intake and exhaust camshaft sprocket bolts.

- Secure the hexagonal portion of camshaft using wrench to loosen mounting bolts.

c. Remove timing chain (secondary) together with camshaft sprockets.

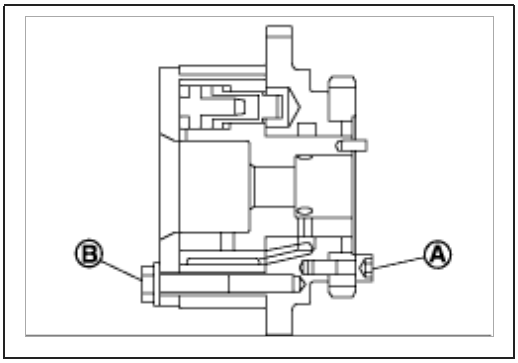
- Turn camshaft slightly to secure slackness of timing chain (secondary) on timing chain tensioner (secondary) side.



- Insert **0.5 mm (0.020 inch)** -thick metal or resin plate between timing chain and timing chain tensioner plunger (guide). Remove timing chain (secondary) together with camshaft sprockets with timing chain loose from guide groove.

CAUTION: Be careful of plunger coming-off when removing timing chain (secondary). This is because plunger of timing chain tensioner (secondary) moves during operation, leading to coming-off of fixed stopper pin.

NOTE: Camshaft sprocket (INT) is two-for-one structure of primary and secondary sprockets.

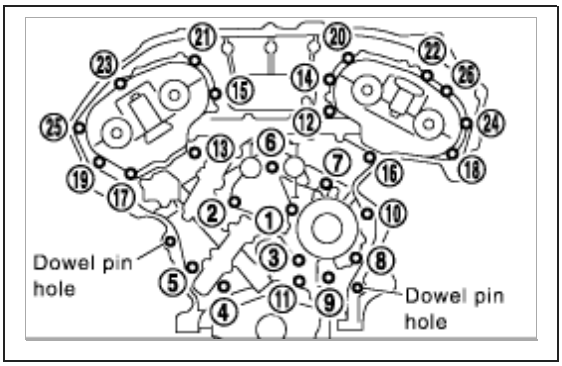


- When handling camshaft sprocket (INT), be careful of the following:

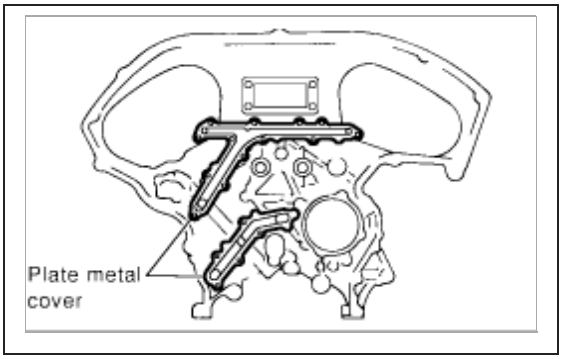
CAUTION:

- Handle carefully to avoid any shock to camshaft sprocket.
- Do not disassemble. (Do not loosen bolts "A" and "B" as shown in the figure).

29. Remove rear timing chain case as follows:

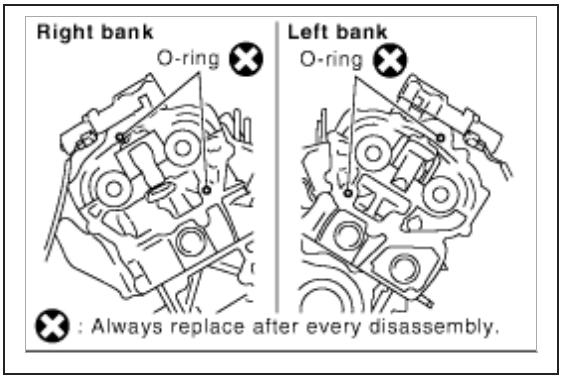


a. Loosen and remove mounting bolts in reverse order as shown in the figure.
b. Cut sealant using seal cutter [SST: KV10111100 (J-37228)] or equivalent tool and remove rear timing chain case.

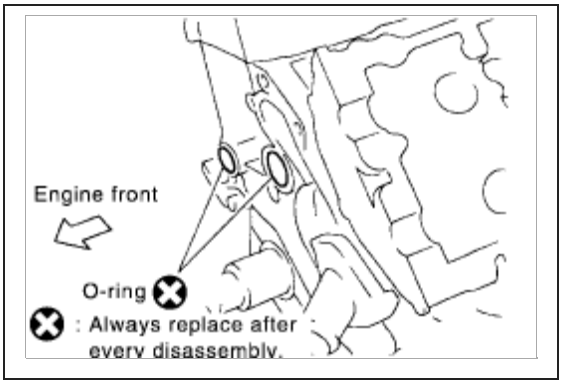


CAUTION:

- Do not remove plate metal cover of oil passage.
- After removal, handle rear timing chain case carefully so it does not tilt, cant, or warp under a load.

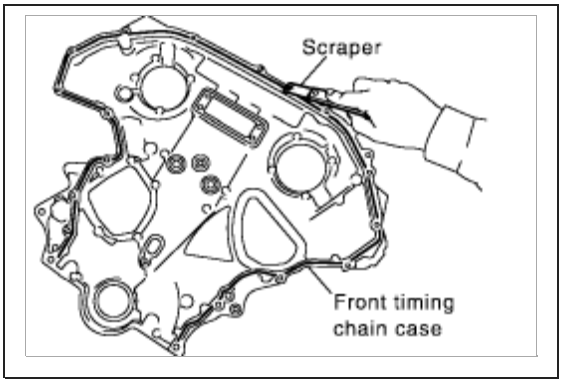


30. Remove O-rings from cylinder head.



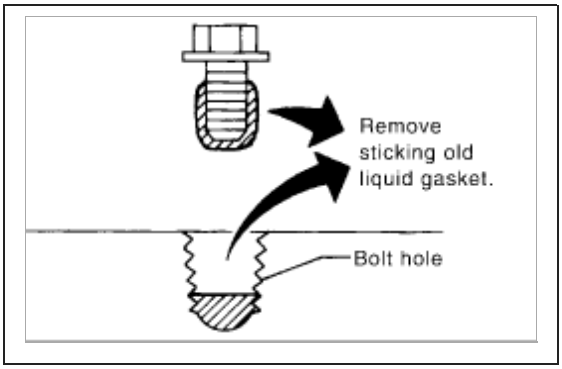
31. Remove O-rings from cylinder block.
32. Remove timing chain tensioners (secondary) from cylinder head as follows, if necessary.

    a. Remove camshaft brackets (No. 1). Refer to "REMOVAL".
    b. Remove timing chain tensioners (secondary) with stopper Din attached.

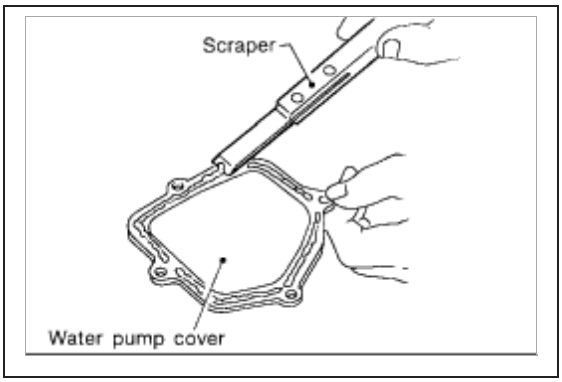


33. Use scraper to remove all traces of liquid gasket from front and rear timing chain cases, and opposite mating

surfaces.



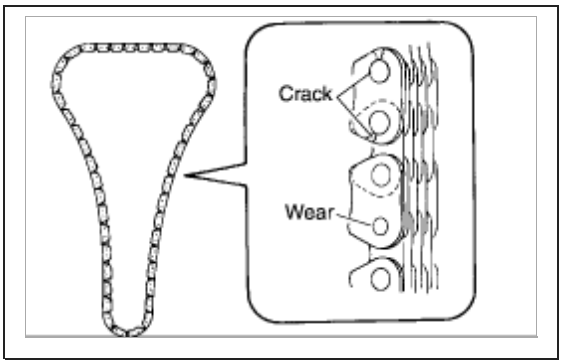
- Remove old liquid gasket from bolt hole and thread.



34. Use scraper to remove all traces of liquid gasket from water pump cover, chain tensioner cover and intake valve timing control covers.

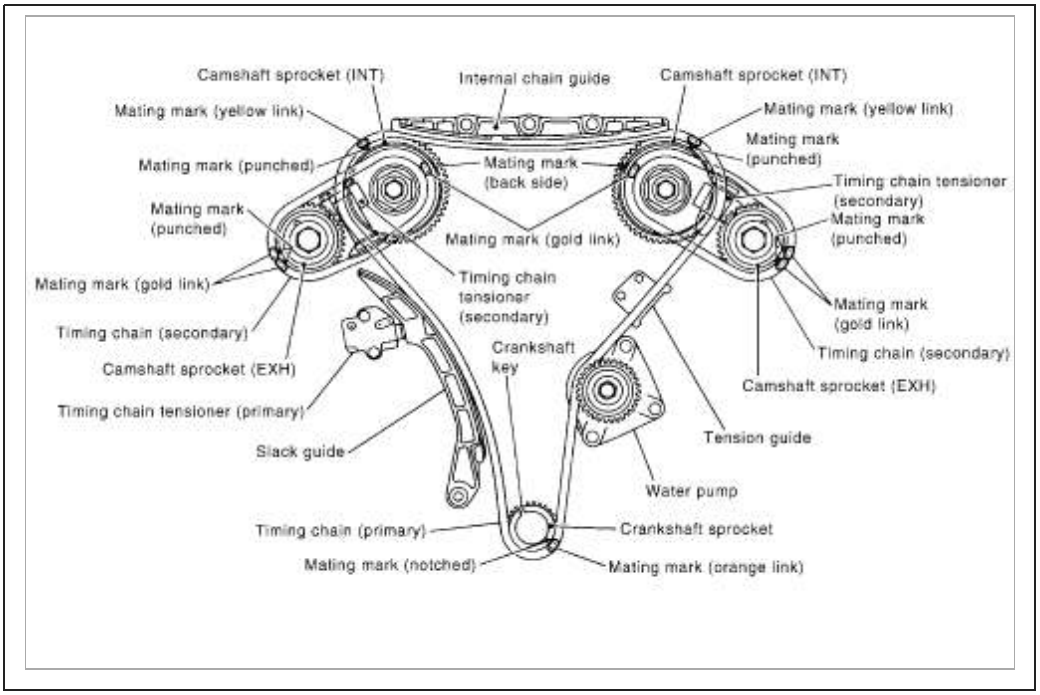
INSPECTION AFTER REMOVAL

Timing Chain



Check for cracks and any excessive wear at the roller links of timing chain. Replace timing chain as necessary.

INSTALLATION

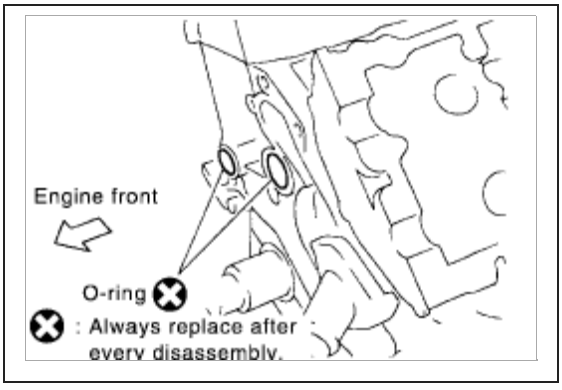


NOTE: The figure shows the relationship between the mating mark on each timing chain and that on the corresponding sprocket, with the components installed.

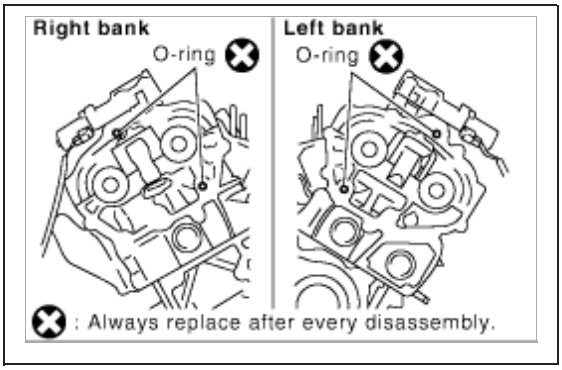
1. Install timing chain tensioners (secondary) to cylinder head as follows if removed. Refer to "INSTALLATION".

    a. Install timing chain tensioners (secondary) with stopper pin attached and new O-ring.
    b. Install camshaft brackets (No. 1). Refer to "INSTALLATION".

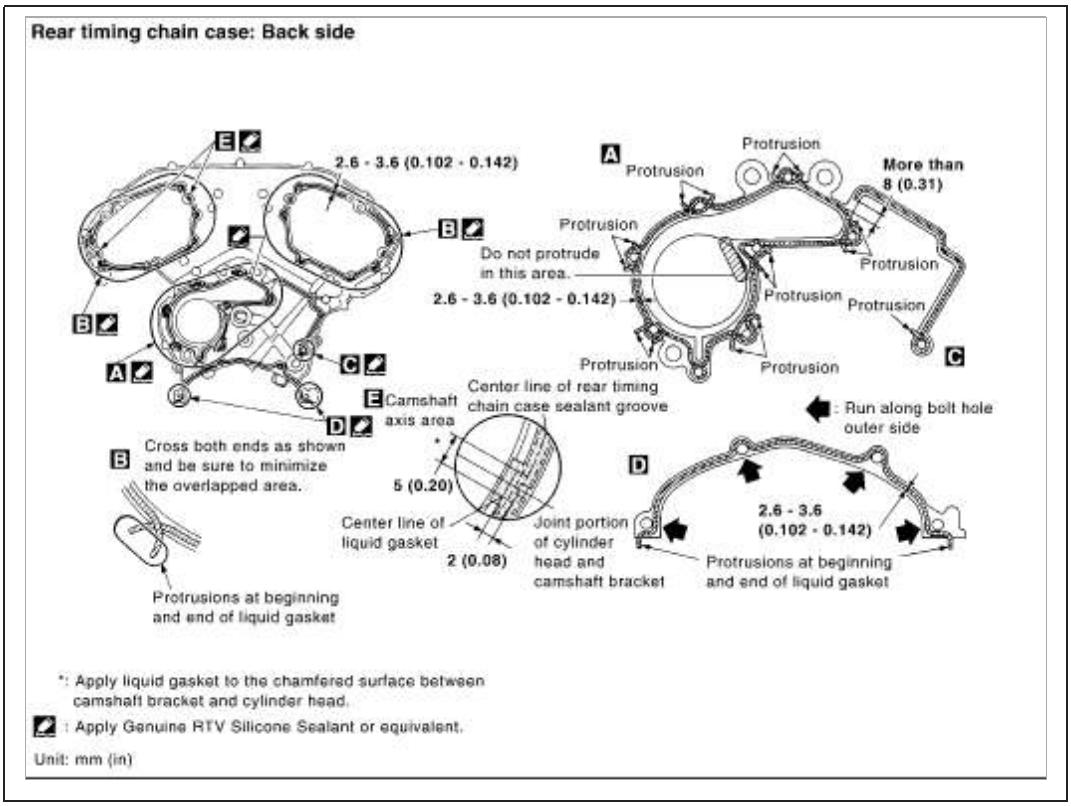
2. Install rear timing chain case as follows-:



    a. Install O-rings onto cylinder block.



b. Install O-rings to cylinder head.



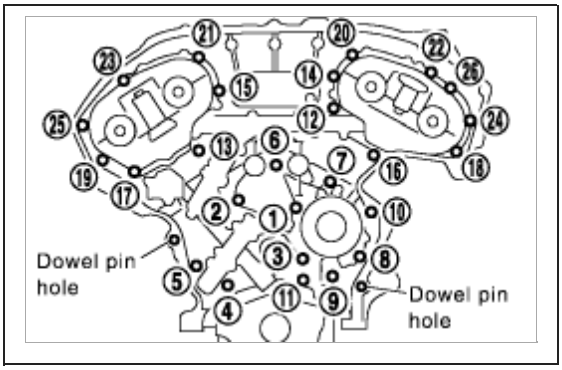
c. Apply liquid gasket to rear timing chain case back side as shown in the figure. Use Genuine RTV Silicone Sealant or equivalent. Refer to "RECOMMENDED CHEMICAL PRODUCTS AND SEALANTS".

CAUTION:

- For "A" in the figure, completely wipe out liquid gasket extended on a portion touching at engine coolant.
- Apply liquid gasket on installation position of water pump and cylinder head very completely.

d. Align rear timing chain case and water pump assembly with dowel pins (right and left) on cylinder block and install rear timing chain case.

- Make sure O-rings stay in place during installation to cylinder block and cylinder head.



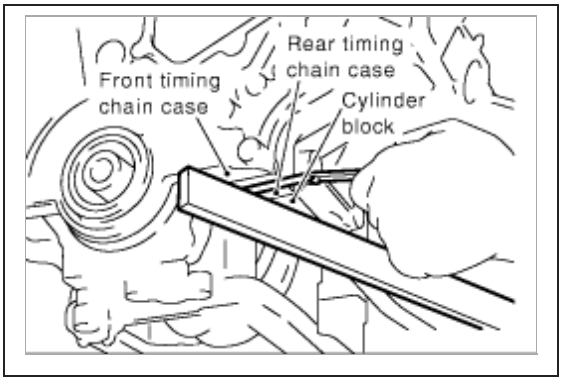
e. Tighten mounting bolts in numerical order as shown in the figure.

- There are two types of mounting bolts. Refer to the following for locating bolts. Bolt length: Bolt position

20 mm (0.79 inch): 1, 2, 3, 6, 7, 8, 9, 10
16 mm (0.63 inch): Except the above
Tightening Torque: **11.7 - 13.7 Nm (1.2 - 1.4 kg-m, 9 - 10 ft. lbs.)**

f. After all bolts are tightened, retighten them to the specified in numerical order shown in the figure.

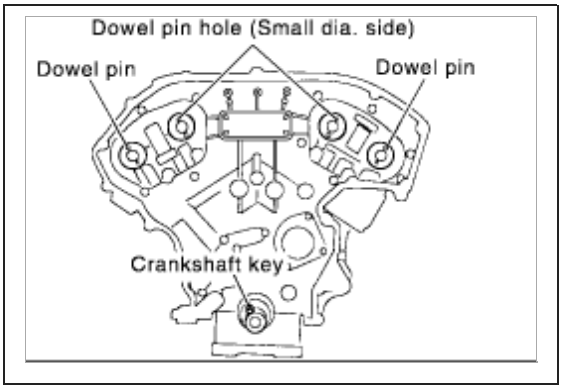
- If the RTV Silicone Sealant protrudes, wipe it off immediately.



g. After installing rear timing chain case, check surface height difference between the following parts on the oil pan (upper) mounting surface. Standard

Rear timing chain case to cylinder block: **-0.24 to 0.14 mm (-0.0094 to 0.0055 inch)** . If out of the standard, repeat the installation procedure.

3. Install tension guide.



4. Position crankshaft so No. 1 piston is set at TDC on the compression stroke.
    - Make sure that dowel pin hole, dowel pin and crankshaft key are located as shown in the figure.

NOTE: Though camshaft does not stop at the position as shown in the figure, for the placement of cam nose, it is generally accepted camshaft is placed for the same direction of the figure.

Camshaft dowel pin hole (intake side)
: At cylinder head upper face side in each bank.

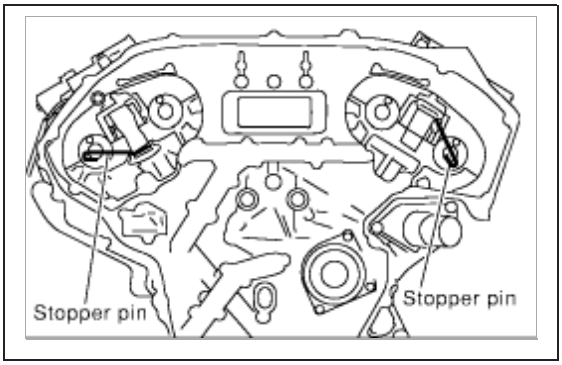
Camshaft dowel pin (exhaust side)
: At cylinder head upper face side in each bank.

Crankshaft key
: At cylinder head side of right bank.

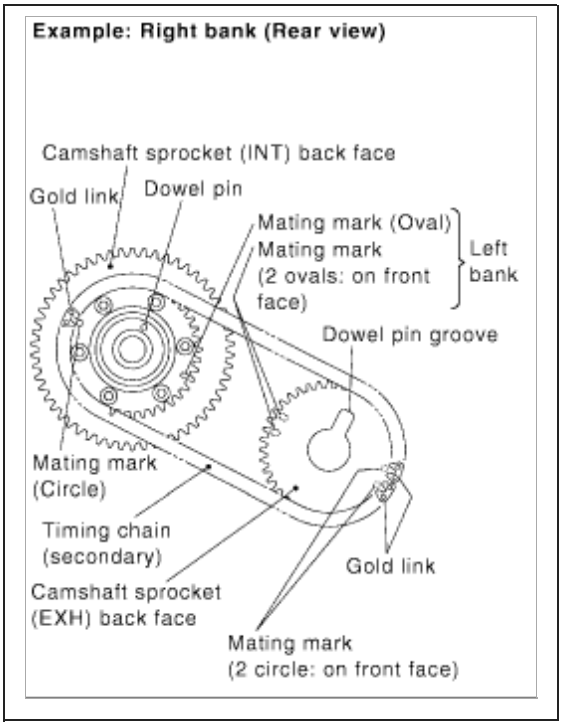
CAUTION: Hole on small dia. side must be used for intake side dowel pin hole. Do not misidentify (ignore big dia. side).

5. Install timing chains (secondary) and camshaft sprockets as follows:

CAUTION: Mating marks between timing chain (secondary) and sprockets slip easily. Confirm all mating mark positions repeatedly during the installation process.



a. Push plunger of timing chain tensioner (secondary) and keep it pressed in with stopper pin.



b. Install timing chains (secondary) and camshaft sprockets.

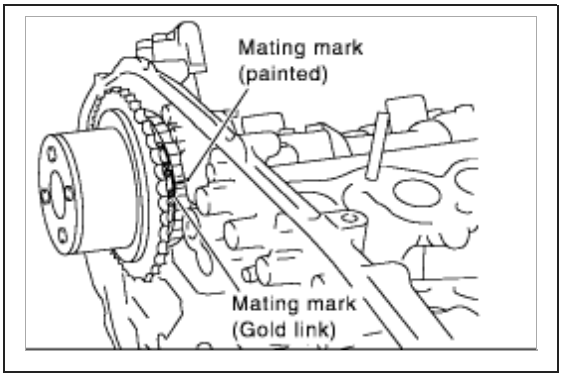
- Align the mating marks on timing chain (secondary) (gold link) with the ones on intake and exhaust camshaft sprockets (punched), and install them.

NOTE:

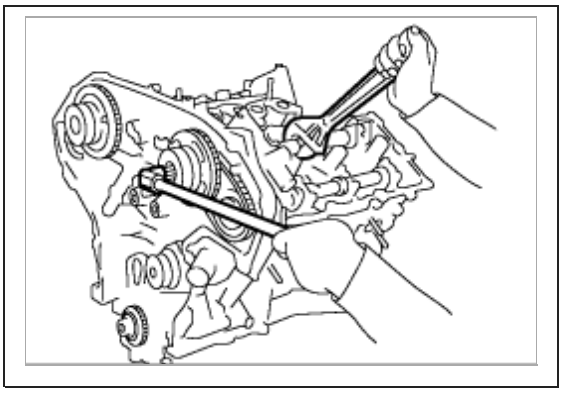
- Mating marks for intake camshaft sprocket are on the back side of camshaft sprocket (secondary).
- There are two types of mating marks, circle and oval types. They should be used for the right and left banks, respectively.

right bank: Use circle type.
left bank: Use oval type.

- Align dowel pin and pin hole on camshafts with the groove and dowel pin on sprockets, and install them.
- On the intake side, align pin hole on the small diameter side of the camshaft front end with dowel pin on the back side of camshaft sprocket, and install them.
- On the exhaust side, align dowel pin on camshaft front end with pin groove on camshaft sprocket, and install them.
- In a case that positions of each mating mark and each dowel Din are not fit on mating parts. make fine adjustment to the position holding the hexagonal portion on camshaft with wrench or equivalent.
- Mounting bolts for camshaft sprockets must be tightened in the next step. Tightening them by hand is enough to prevent the dislocation of dowel pins.

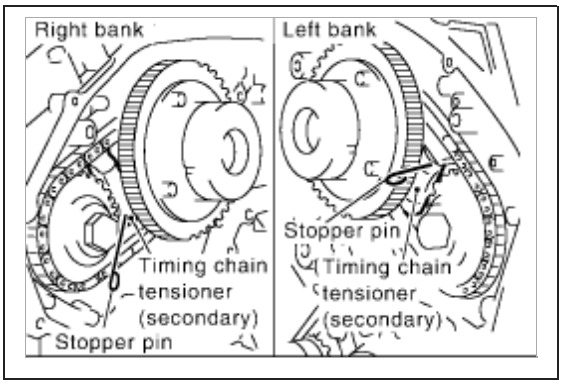


- It may be difficult to visually check the dislocation of mating marks during and after installation. To make the matching easier, make a mating mark on the top of sprocket teeth and its extended line in advance with paint.



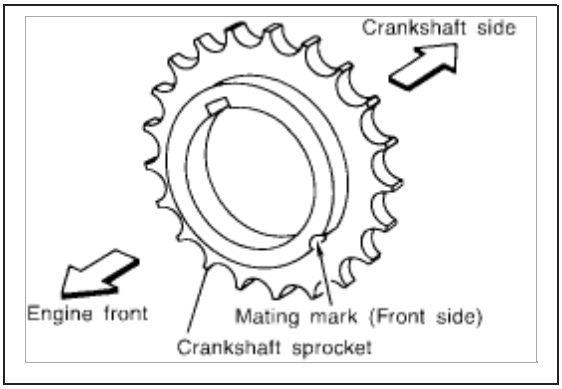
c. After confirming the mating marks are aligned, tighten camshaft sprocket mounting bolts.

- Secure camshaft using wrench at the hexagonal portion to tighten mounting bolts.



d. Pull stopper pins out from timing chain tensioners (secondary).

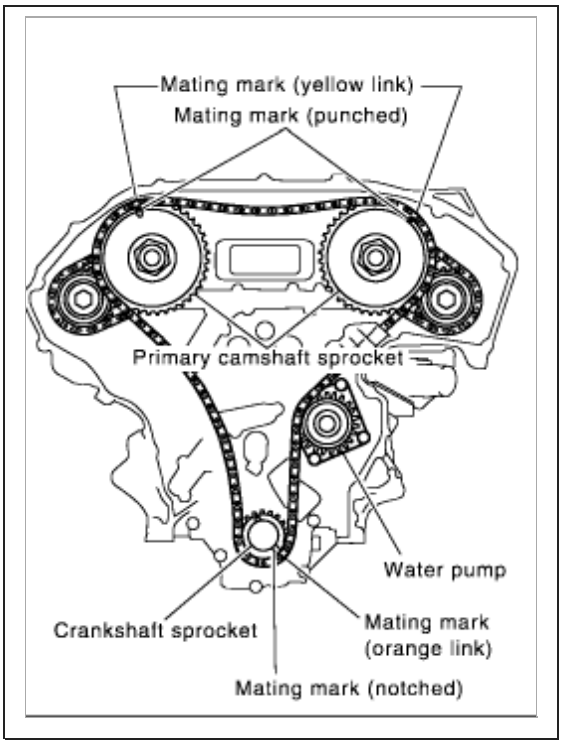
6. Install timing chain (primary) as follows:



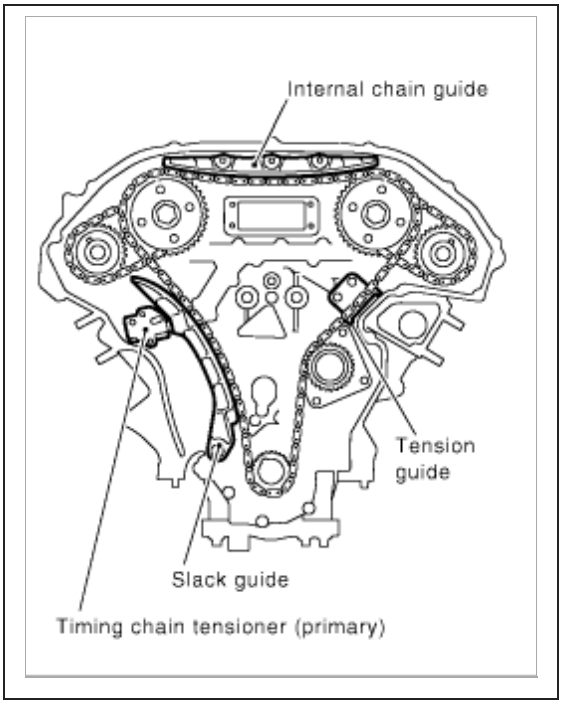
a. Install crankshaft sprocket.

- Make sure the mating marks on crankshaft sprocket face the front of engine.

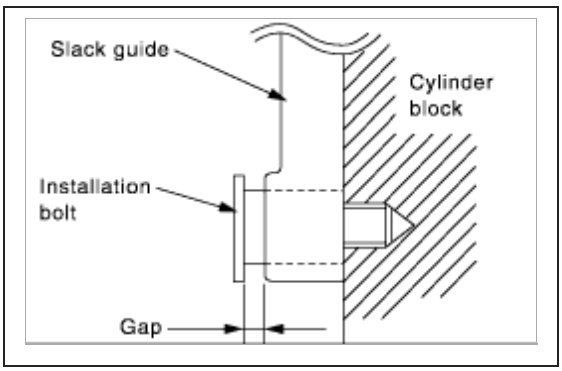
b. Install timing chain (primary).



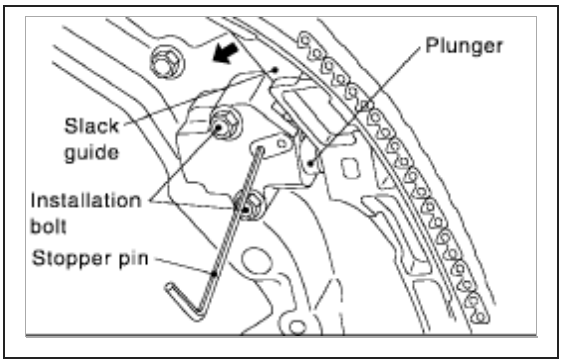
- Install timing chain (primary) so the mating mark (punched) on camshaft sprocket is aligned with the yellow link on timing chain, while the mating mark (notched) on crankshaft sprocket is aligned with the orange one on timing chain, as shown in the figure.
- When it is difficult to align mating marks of timing chain (primary) with each sprocket, gradually turn camshaft using wrench on the hexagonal portion to align it with the mating marks.
- During alignment, be careful to prevent dislocation of mating mark alignments of timing chains (secondary).



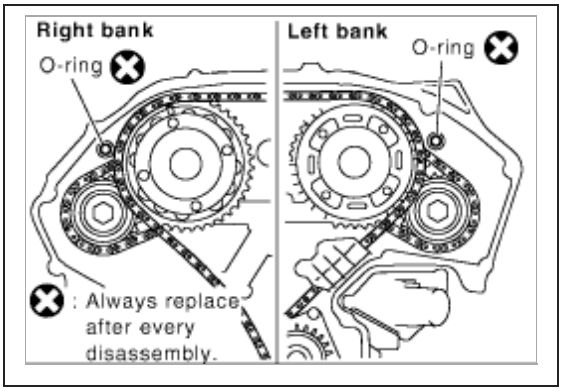
7. Install internal chain guide and slack guide.



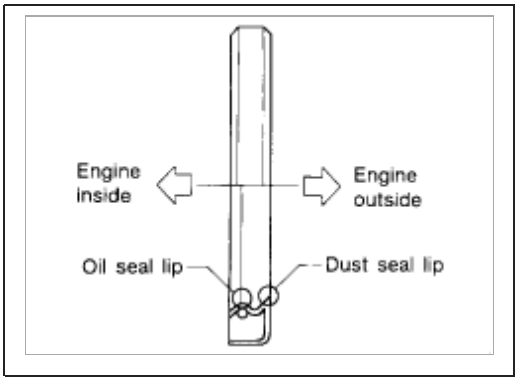
CAUTION: Do not overtighten slack guide mounting bolts. It is normal for a gap to exist under the bolt seats when mounting bolts are tightened to specification.



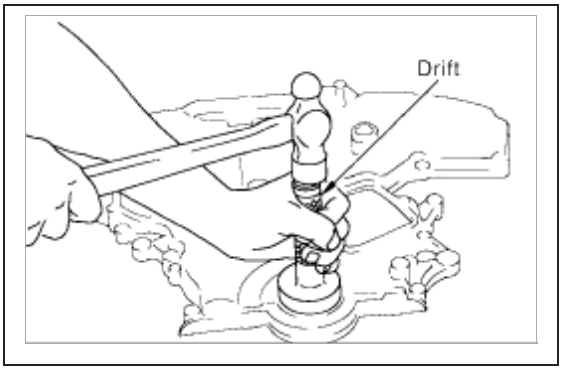
- When installing timing chain tensioner (primary), push in plunger and keep it pressed in with stopper pin.
- Remove any dirt and foreign materials completely from the back and the mounting surfaces of chain tensioner.
- After installation, pull out stopper pin by pressing slack guide.



8. Make sure again that the mating marks on sprockets and timing chain have not slipped out of alignment.
9. Install new O-rings on rear timing chain case.
10. Install front oil seal on front timing chain case. Apply new engine oil to the oil seal lip, dust seal lip and outer round of oil seal.

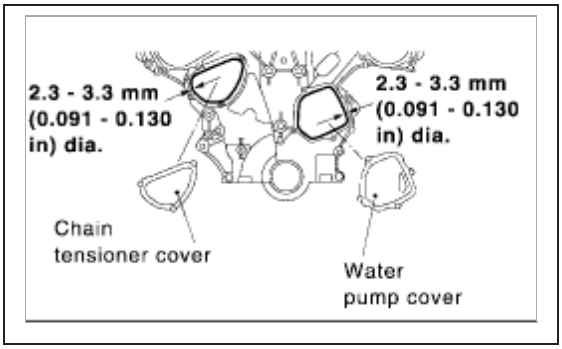


- Install it so that each seal lip is oriented as shown in the figure.



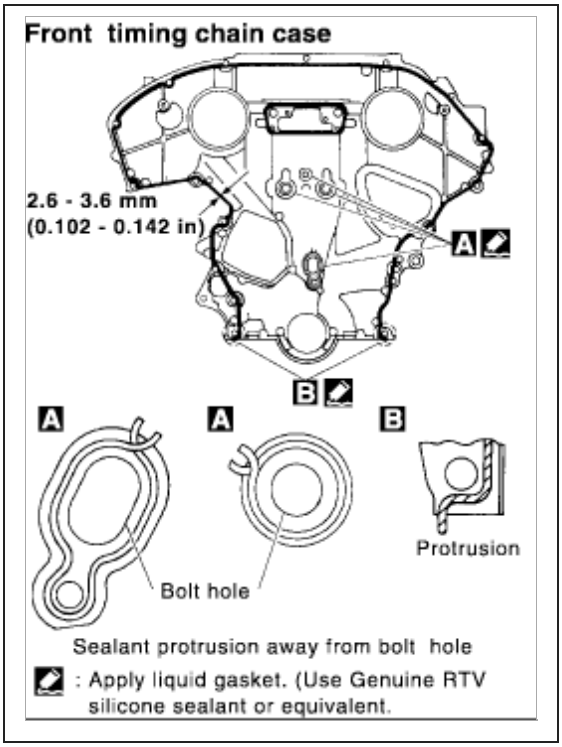
- Using suitable drift, press-fit oil seal until it becomes flush with timing chain case end face.
- Make sure the garter spring is in position and seal lip is not inverted.

11. Install water pump cover and chain tensioner cover to front timing chain case.

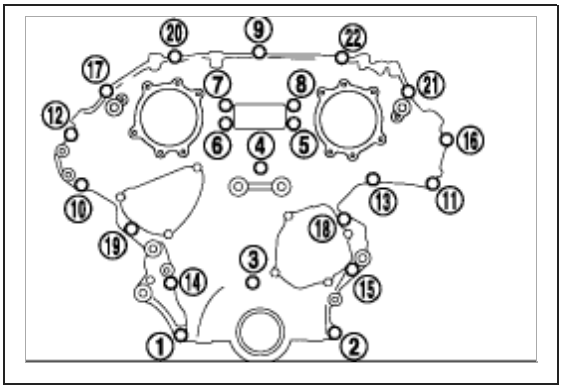


- Apply a continuous bead of liquid gasket with tube presser [SST: WS39930000 (-)] to front timing chain case as shown in the figure. Use Genuine RTV Silicone Sealant or equivalent. Refer to "RECOMMENDED CHEMICAL PRODUCTS AND SEALANTS".

12. Install front timing chain case as follows:



a. Apply liquid gasket to front timing chain case back side as shown in the figure. Use Genuine RTV Silicone Sealant or equivalent. Refer to "RECOMMENDED CHEMICAL PRODUCTS AND SEALANTS".
b. Install dowel pin on rear timing chain case into dowel pin hole on front timing chain case.

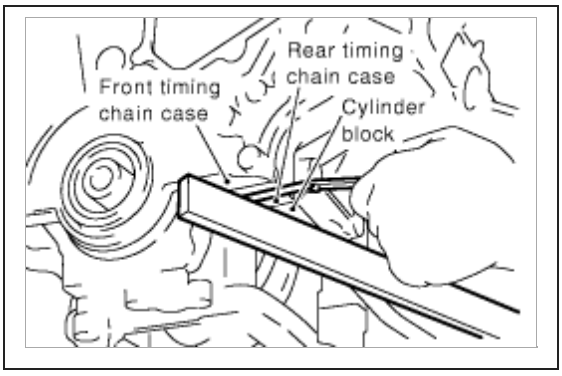


c. Tighten bolts to the specified torque in numerical order as shown in the figure.

- There are two types of mounting bolts. Refer to the following for locating bolts. M8 bolts: 1,2

Tightening Torque: **25.5 - 31.3 Nm (2.6 - 3.2 kg-m, 19 - 23 ft. lbs.)**
M8 bolts: Except the above
Tightening Torque: **11.7 - 13.7 Nm (1.2 - 1.4 kg-m, 9 - 10 ft. lbs.)**

d. After all bolts are tightened, retighten them to the specified torque in numerical order shown in the figure.

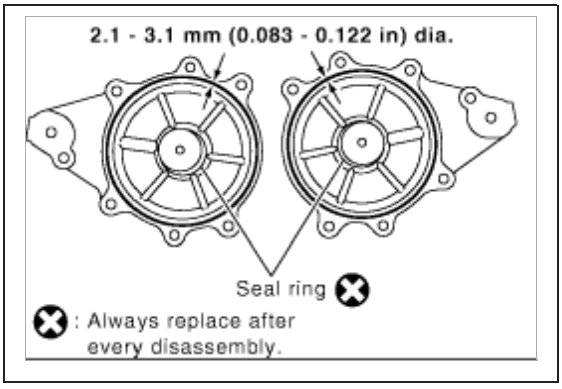


e. After installing front timing chain case, check surface height difference between the following parts on the oil pan (upper) mounting surface. Standard

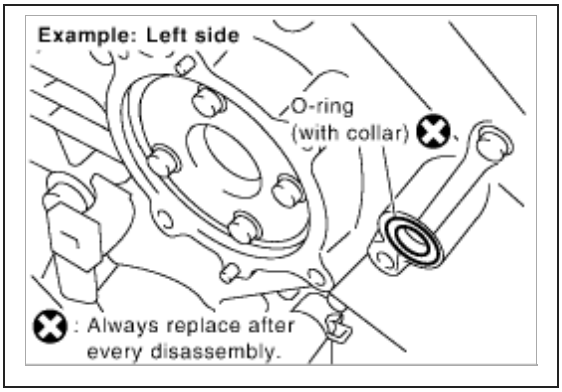
Front timing chain case to rear timing chain case: **-0.14 to 0.14 mm (-0.005 to 0.0055 inch)**

- If out of the standard, repeat the installation procedure.

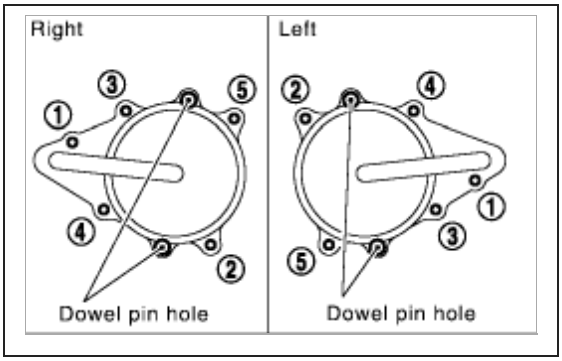
13. Install right and left intake valve timing control covers as follows:



a. Install seal rings in shaft grooves.
b. Apply liquid gasket to intake valve timing control covers as shown in the figure. Use Genuine RTV Silicone Sealant or equivalent. Refer to "RECOMMENDED CHEMICAL PRODUCTS AND SEALANTS".



c. Install collared O-ring in front timing chain case oil hole (left and right sides).
d. Being careful not to move seal ring from the installation groove, align dowel pins on front timing chain case with holes to install intake valve timing control covers.



e. Tighten bolts in numerical order as shown in the figure.

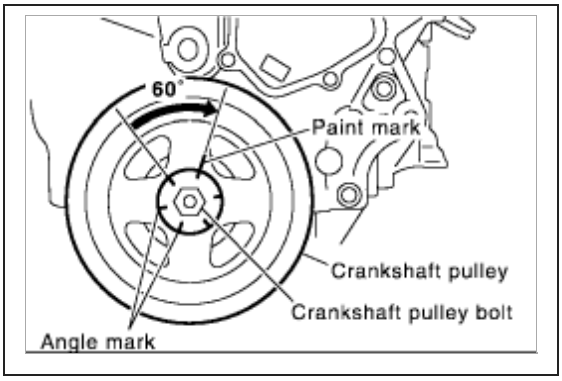
14. Install oil pans (upper and lower). Refer to "OIL PAN AND OIL STRAINER".

15. Install rocker covers (right and left banks). Refer to "ROCKER COVER".
16. Install crankshaft pulley as follows:

    a. Fix crankshaft using ring gear stopper [SST: KV10117700 (J-44716)].
    b. Install crankshaft pulley, taking care not to damage front oil seal.

- When press-fitting crankshaft pulley with plastic hammer, tap on its center portion (not circumference).

    c. Tighten crankshaft pulley bolt. Tightening Torque: **39.2 - 49.0 Nm (4.0 - 5.0 kg-m, 29 - 36 ft. lbs.)**



    d. Put a paint mark on crankshaft pulley aligning with angle mark on crankshaft pulley bolt. Then, further retighten bolt by 60 to 65 degrees [Target:**60 degrees** (equivalent to one graduation)].

17. Rotate crankshaft pulley in normal direction (clockwise when viewed from engine front) to confirm it turns smoothly.
18. Install in the reverse order of removal after this step.

NOTE: If hydraulic pressure inside timing chain tensioner drops after removal/installation, slack in guide may generate a pounding noise during and just after engine start. However, this does not indicate an unusualness. Noise will stop after hydraulic pressure rises.

INSPECTION AFTER INSTALLATION

Inspection for Leaks

The followings are procedures for checking fluids leak, lubricates leak.

- Before starting engine, check oil/fluid levels including engine coolant and engine oil. If less than required quantity, fill to the specified level. Refer to "RECOMMENDED FLUIDS AND LUBRICANTS".
- Use procedure to check for fuel leakage.
- Turn ignition switch "ON" (with engine stopped). With fuel pressure applied to fuel piping, check for fuel leakage at connection points.
- Start engine. With engine speed increased, check again for fuel leakage at connection points.
- Run engine to check for unusual noise and vibration.

NOTE: If hydraulic pressure inside chain tensioner drops after removal/installation, slack in guide may generate a pounding noise during and just after the engine start. However, this does not indicate an unusualness. Noise will stop after hydraulic pressure rises.

- Warm up engine thoroughly to make sure there is no leakage of fuel, or any oil/fluids including engine oil and engine coolant.
- Bleed air from lines and hoses of applicable lines, such as in cooling system.
- After cooling down engine, again check oil/fluid levels including engine oil and engine coolant. Refill to the specified level, if necessary.

Item	Before starting engine	Engine running	After engine stopped
Engine coolant	Level	Leakage	Level
Engine oil	Level	Leakage	Level
Other oils and fluid*	Level	Leakage	Level
Fuel	Leakage	Leakage	Leakage

* Transmission/transaxle/CVT fluid, power steering fluid, brake fluid, etc.

Summary of the inspection items