

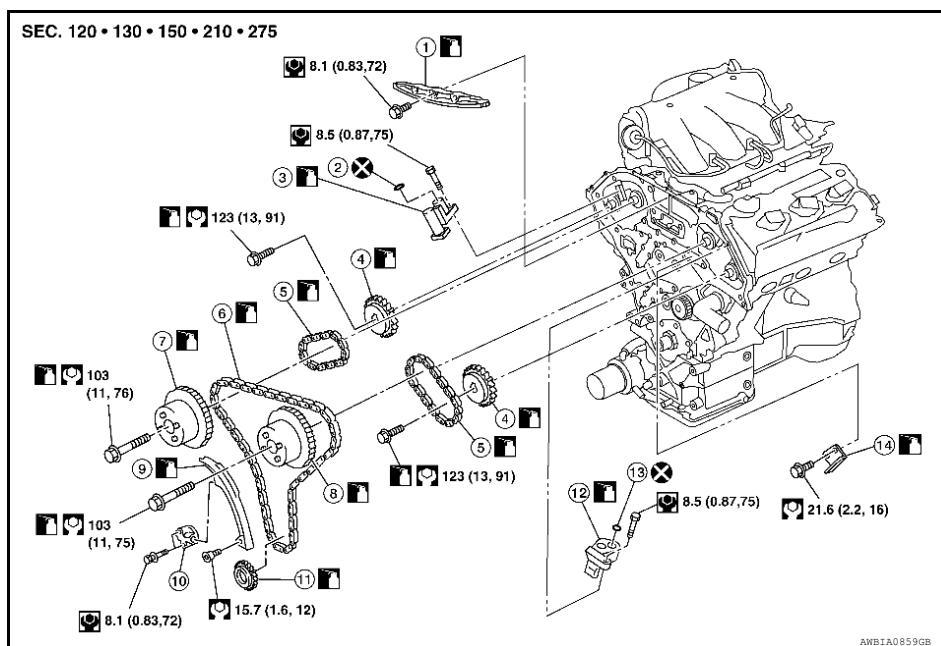
## Engine mechanical > Vq40de > On-vehicle repair > Timing chain

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### TIMING CHAIN

#### Exploded View

INFOID:0000000005260461



- |                                      |                               |   |
|--------------------------------------|-------------------------------|---|
| 1. Internal chain guide              | 2. O-ring                     | 3. Timing chain tensioner (secondary) (RH)  |
| 4. Camshaft sprocket (EXH)           | 5. Timing chain (secondary)   | 6. Timing chain (primary)                   |
| 7. Camshaft sprocket RH (INT)        | 8. Camshaft sprocket LH (INT) | 9. Slack guide                              |
| 10. Timing chain tensioner (primary) | 11. Crankshaft sprocket       | 12. Timing chain tensioner (secondary) (LH) |
| 13. O-ring                           | 14. Tension guide             |   |

#### Removal and Installation

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#### CAUTION:

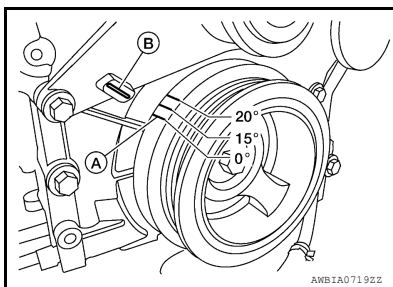
- After removing timing chains, do not turn the crankshaft and camshaft separately, or the valves will strike the pistons.
- When installing camshafts, chain tensioners, oil seals, or other sliding parts, lubricate contacting surfaces with new engine oil.
- Apply new engine oil to bolt threads and seat surfaces when installing camshaft sprockets, camshaft brackets, and crankshaft pulley.

#### NOTE:

It is not necessary to remove the rocker covers or intake manifold collector to remove or install the timing chain(s).

#### REMOVAL

1. Set No. 1 cylinder to TDC.
  - Rotate crankshaft pulley clockwise to align **timing** mark (A) (grooved line without color) with **timing** indicator (B).

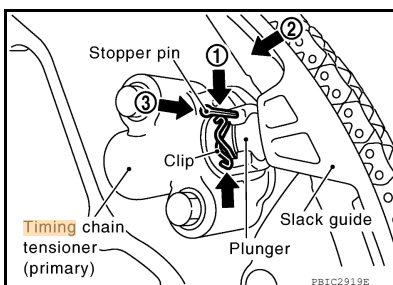


2. Remove front **timing** chain case. Refer to [EM-53. "Removal and Installation"](#).
3. Check **timing** chain markings to confirm No. 1 cylinder is at TDC of its compression stroke.
  - If not, remove Ring Gear Stopper Tool and turn crankshaft clockwise 360° (one revolution).
  - Re-install Ring Gear Stopper Tool.

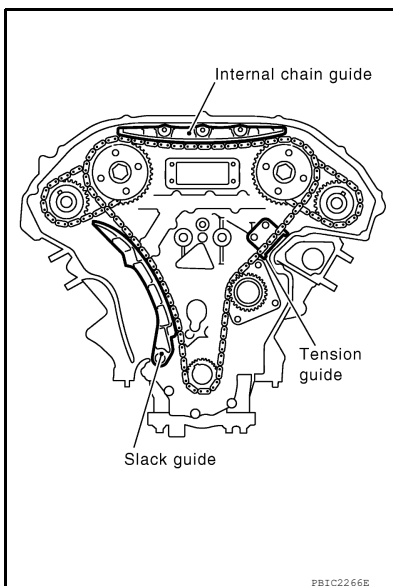
**Tool number** : — (J-48761)

- If the original **timing** chain markings are not legible, use paint or equivalent to mark the **timing** chains to the sprockets.
4. If removing the secondary **timing** chains, loosen camshaft sprocket bolts.
  5. Compress the primary **timing** chain tensioner.
    1. Loosen clip of primary **timing** chain tensioner, and release plunger stopper (1).
    2. Depress plunger into tensioner body by pressing slack guide (2).
    3. Keep slack guide pressed and insert stopper pin through the tensioner body hole and plunger groove (3) to hold plunger in.

**NOTE:**  
Use stopper pin included with Tool J-50246.



6. Remove internal chain guide.



7. Remove **timing** chain (primary).  
**CAUTION:**

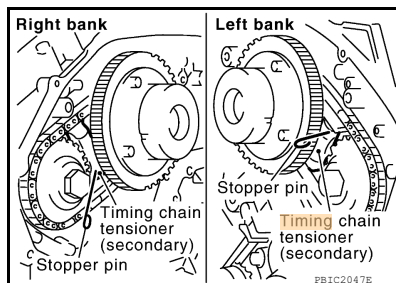


**After removing timing chain (primary), do not turn crankshaft and camshaft separately, or valves will strike the piston heads.**

8. Remove crankshaft sprocket, if necessary.
9. Remove timing chain (secondary) and camshaft sprockets as follows:
- a. Attach stopper pin to the right and left timing chain tensioners (secondary).

**NOTE:**

- Use stopper pin included with Tool J-50246.



- b. Remove camshaft sprocket (INT and EXH) bolts.
- c. Remove timing chain (secondary) together with camshaft sprockets.

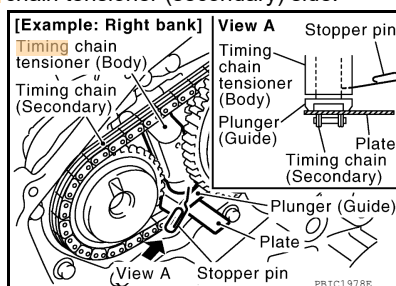
- Turn camshaft slightly to secure slack of timing chain on timing chain tensioner (secondary) side.
- Insert 0.5 mm (0.020 in)-thick metal or resin plate between timing chain and timing chain tensioner plunger (guide). Remove timing chain (secondary) together with camshaft sprockets with timing chain loose from guide groove.

**CAUTION:**

**Be careful of plunger coming off when removing timing chain (secondary).**

**NOTE:**

Camshaft sprocket (INT) is a one piece integrated design with sprockets for timing chain (primary) and for timing chain (secondary).



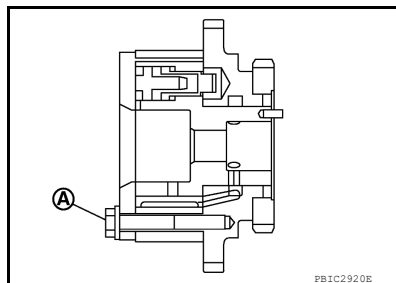
- When handling camshaft sprocket (INT), be careful of the following:

**CAUTION:**

- Handle carefully to avoid any shock to camshaft sprocket.
- Do not disassemble. (Do not loosen bolts (A) as shown).

**NOTE:**

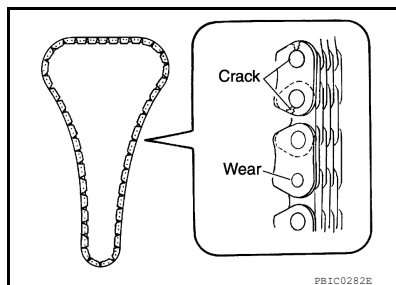
For removal of timing chain tensioner (secondary), refer to [EM-71, "Removal and Installation \(Secondary Timing Chain Tensioner\)"](#). [Removing camshaft bracket (No. 1) is required.]



## INSPECTION AFTER REMOVAL

**Check for cracks and any excessive wear at link plates. Replace chain if necessary.**

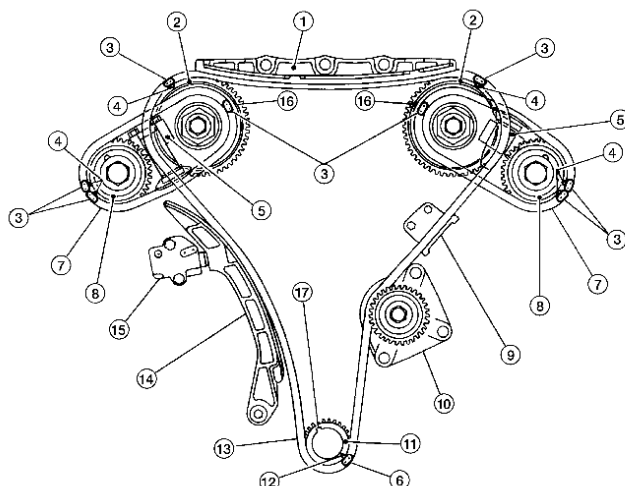
- Inspect all timing chains and associated parts for wear or damage, replace as necessary.



## INSTALLATION



## SEC. 130



- |                             |                                     |                                    |
|-----------------------------|-------------------------------------|------------------------------------|
| 1. Internal chain guide     | 2. Camshaft sprocket (intake)       | 3. Mating mark (blue link)         |
| 4. Mating mark (punched)    | 5. Secondary timing chain tensioner | 6. Mating mark (copper link)       |
| 7. Secondary timing chain   | 8. Camshaft sprocket (exhaust)      | 9. Tensioner guide                 |
| 10. Water pump              | 11. Crankshaft sprocket             | 12. Mating mark (notched)          |
| 13. Primary timing chain    | 14. Slack guide                     | 15. Primary timing chain tensioner |
| 16. Mating mark (back side) | 17. Crankshaft key                  |                                    |

**NOTE:**

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

1. Make sure that dowel pin hole, dowel pin of camshaft and crankshaft key are located as shown. (No. 1 cylinder at compression TDC)

• **NOTE:**

Though camshaft does not stop at the position as shown, 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)**

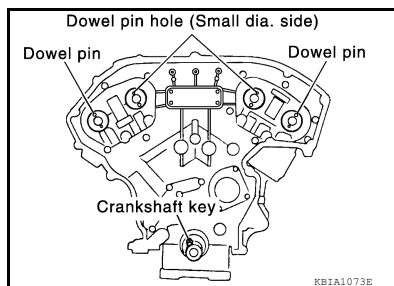
: At cylinder head upper face side in each bank.

**Camshaft dowel pin (exhaust side)**

: At cylinder head upper face side in each bank.

**Crankshaft key**

: At cylinder head side of right bank.



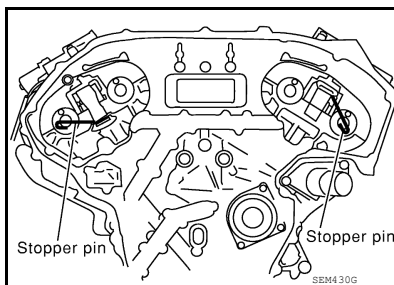
2. Install timing chains (secondary) and camshaft sprockets as follows:

**CAUTION:**

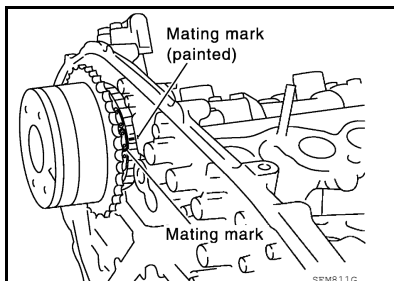
Mating marks between timing chain and sprockets slip easily. Confirm all mating mark positions repeatedly during the installation process.



- a. Push plunger of **timing** chain tensioner (secondary) and keep it pressed in with stopper pin.
- Use stopper pin included with Tool J-50246.



- b. Before installing **timing** chains (secondary) and camshaft sprockets, confirm mating marks are visible. If necessary, use paint or equivalent to re-mark the camshaft sprockets at each mating mark.



- c. Install **timing** chains (secondary) (8) and camshaft sprockets [INT (1) and EXH (9)].
- Left bank mating marks (6)
  - Align the **timing** chain mating marks (secondary) (2) (blue color link) with the ones on camshaft sprockets (INT and EXH) (4), (5), (7) and (10) (punched), and install them.

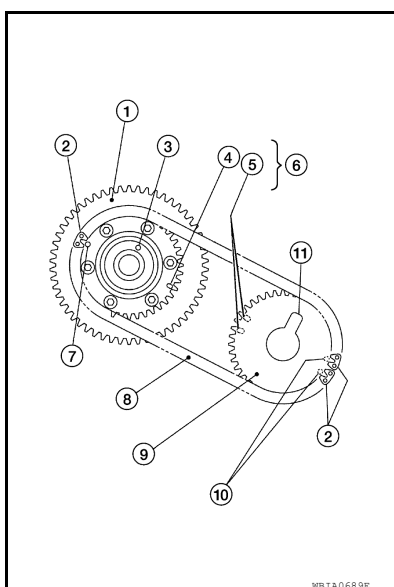
**NOTE:**

- Mating marks for camshaft sprocket (INT) are on the back side of camshaft sprocket (secondary).
- There are two types of mating marks, circle (7), (10) and oval (4), (5) types. They should be used for the right and left banks, respectively.

**Right bank : Use circle type (7) and (10).**

**Left bank : Use oval type (4) and (5).**

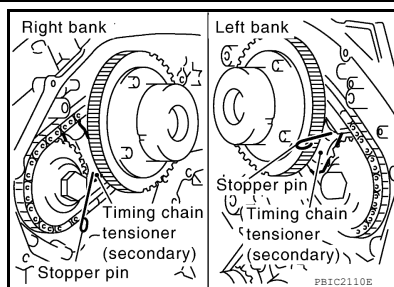
- Align dowel pin (3) and pin hole on camshafts with the groove (11) and dowel pin on sprockets, and install them.
- On the intake side, align pin hole on the small diameter side of the camshaft front end with dowel pin (3) on the back side of camshaft sprocket, and install them.
- On the exhaust side, align dowel pin on camshaft front end with pin groove (11) on camshaft sprocket, and install them.
- In case that positions of each mating mark and each dowel pin do not fit on mating parts, make fine adjustment to the position by slightly turning camshaft(s).
- Bolts for camshaft sprockets must be tightened in the next step. Tightening them by hand is enough to prevent the dislocation of dowel pins.



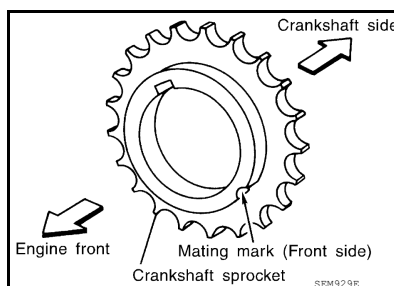
- d. Confirm the mating marks are aligned, then finger tighten camshaft sprocket bolts. Final tightening will be done with all **timing** chains installed.



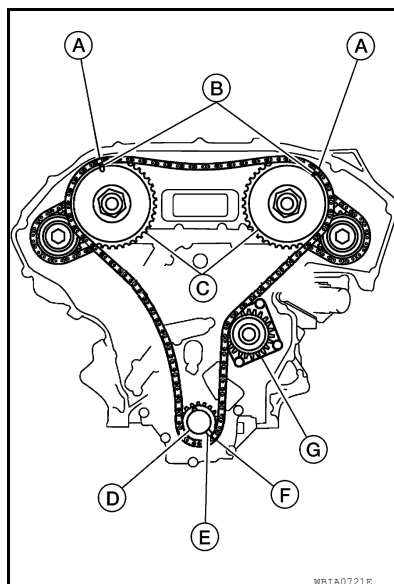
- e. Remove stopper pins out from **timing** chain tensioners (secondary).



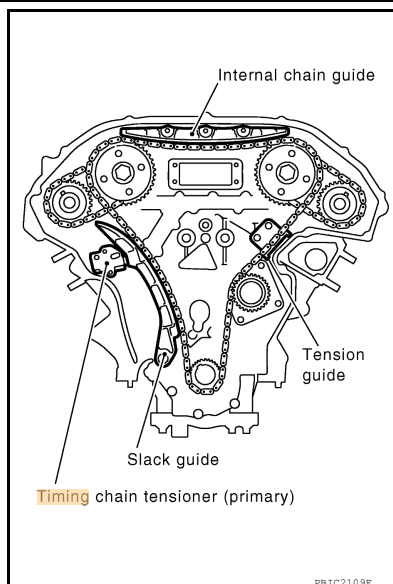
3. Install **timing** chain (primary) as follows:
- a. Install crankshaft sprocket.
- Make sure the mating marks on crankshaft sprocket face the front of engine.



- b. Install the primary **timing** chain.
- Water pump (G).
  - Install primary **timing** chain so the mating mark punched (B) on the camshaft sprocket is aligned with the blue link (A) on the timing chain, while the mating mark notched (E) on the crankshaft sprocket (D) is aligned with the copper link (F) on the **timing** chain, as shown.
  - When it is difficult to align mating marks (A) with (B) and (E) with (F) of the primary **timing** chain with each sprocket, gradually turn the camshaft to align it with the mating marks.
  - During alignment, be careful to prevent dislocation of mating mark alignments of the secondary **timing** chains.



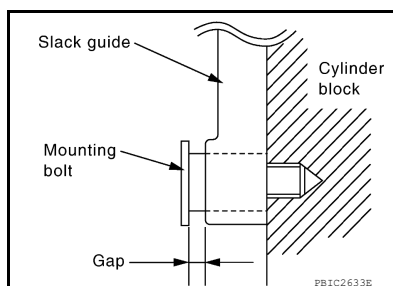
## 4. Install internal chain guide.



- If removed, reinstall slack guide.

**CAUTION:**

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



- Remove stopper pin from primary timing chain tensioner.
5. Make sure again that the mating marks on camshaft sprockets and timing chain have not slipped out of alignment.
  6. Tighten camshaft sprocket bolts to specification with all timing chains installed and Ring Gear Stopper Tool holding the crankshaft.

**Tool number** : — (J-48761)

7. Install front timing chain case. Refer to [EM-53, "Removal and Installation"](#).

**INSPECTION AFTER INSTALLATION**

- 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 [MA-17, "FOR USA AND CANADA : Fluids and Lubricants"](#) (United States and Canada) and [MA-18, "FOR MEXICO : Fluids and Lubricants"](#) (Mexico).
- Use procedure below 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 timing chain tensioner drops after removal and installation, slack in the guide may generate a pounding noise during and just after engine start. However, this is normal. Noise will stop after hydraulic pressure rises.



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

Item		Before starting engine	Engine running	After engine stopped
Engine coolant		Level	Leakage	Level
Engine oil		Level	Leakage	Level
Transmission/ transaxle fluid	A/T and CVT Models	Leakage	Level/Leakage	Leakage
	M/T Models	Level/Leakage	Leakage	Level/Leakage
Other oils and fluids*		Level	Leakage	Level
Fuel		Leakage	Leakage	Leakage
Exhaust gas		—	Leakage	—

\*Power steering fluid, brake fluid, etc.