

2012 - Mazda6 - Engine

VARIABLE VALVE TIMING ACTUATOR REMOVAL/ INSTALLATION [MZI 3.7 V6]

WARNING:

- Fuel vapor is hazardous. It can very easily ignite, causing serious injury and damage. Always keep sparks and flames away from fuel.
- Fuel line spills and leakage are dangerous. Fuel can ignite and cause serious injuries or death and damage. Fuel can also irritate skin and eyes. To prevent this, always complete the "Fuel Line Safety Procedure". (See [BEFORE SERVICE PRECAUTION \[MZI 3.7 V6\]](#).)
- Continuous exposure to USED engine oil has caused skin cancer in laboratory mice. Protect your skin by washing with soap and water immediately after working with engine oil.

CAUTION:

- The variable valve timing actuator cannot be disassembled because it is a precision unit.

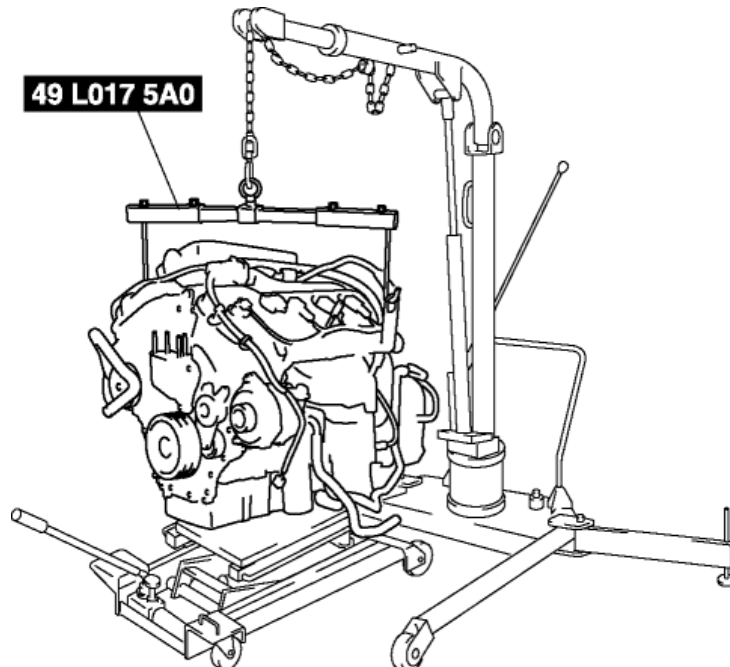
NOTE:

- The following procedure "VARIABLE VALVE TIMING ACTUATOR REMOVAL/INSTALLATION" is performed after the engine and transaxle component is removed from the vehicle. (See [ENGINE REMOVAL/ INSTALLATION \[MZI 3.7 V6\]](#).)

1. Drain the engine oil. (See [ENGINE OIL REPLACEMENT \[MZI 3.7 V6\]](#).)
2. Remove the engine and transaxle component. (See [ENGINE REMOVAL/ INSTALLATION \[MZI 3.7 V6\]](#).)
3. Secure the engine and transaxle component using a hoist and the SST.

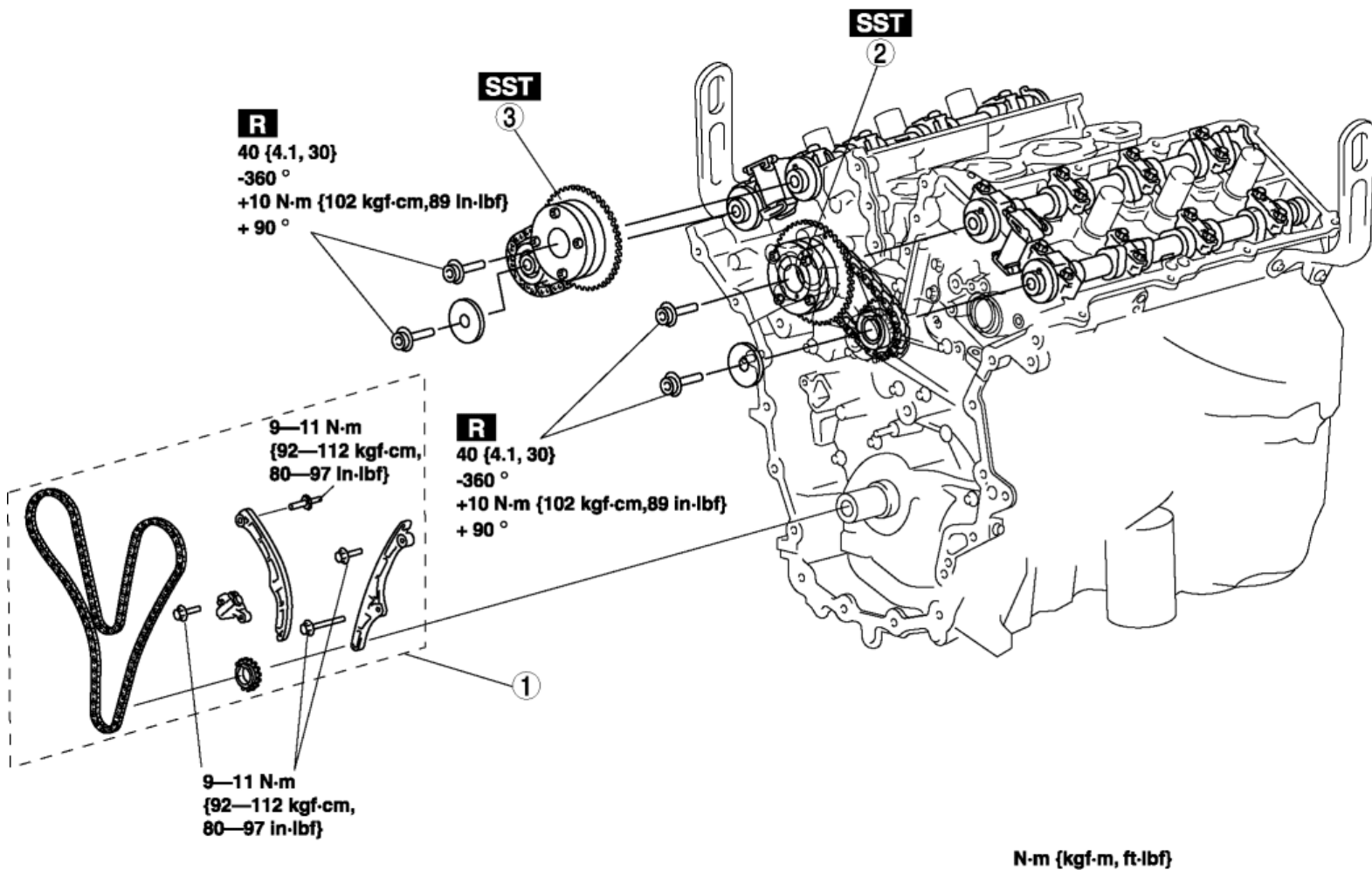
WARNING:

- Protect and stabilize the lowered engine and transaxle component with crossties to prevent injury or damage due to roll over.



4. Remove the dynamic chamber and throttle body as a single unit. (See [INTAKE-AIR SYSTEM REMOVAL/ INSTALLATION \[MZI 3.7 V6\]](#).)
5. Remove the ignition coils. (See [IGNITION COIL REMOVAL/ INSTALLATION \[MZI 3.7 V6\]](#).)
6. Remove the dipstick.
7. Remove the power steering oil pump drive belt. (See [DRIVE BELT REMOVAL/ INSTALLATION \[MZI 3.7 V6\]](#).)
8. Remove the power steering oil pump. (See [POWER STEERING OIL PUMP REMOVAL/ INSTALLATION \[MZI 3.7 V6\]](#).)
9. Remove in the order indicated in the table.

10. Install in the reverse order of removal.
11. Start the engine and:
 - a. Inspect the runout and contact on the pulley and belt.
 - b. Inspect for engine oil, engine coolant, ATF, power steering fluid and fuel leakage.
 - c. Verify the ignition timing, idle speed and idle mixture. (See [ENGINE TUNE-UP \[MZI 3.7 V6\]](#).)
 - d. Engine accessories operation.
12. Perform a road test.



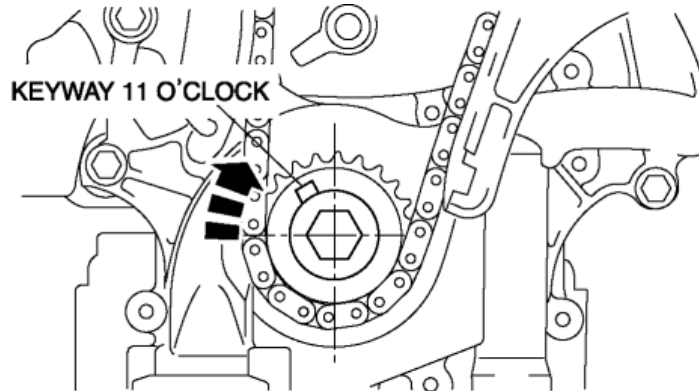
1	Timing chain component (See Timing Chain Component Removal Note.) (See Variable Valve Timing Actuator Component Installation Note.)
2	Variable valve timing actuator component (LH) (See Variable Valve Timing Actuator Component Removal Note.) (See Variable Valve Timing Actuator Component Installation Note.)
3	Variable valve timing actuator component (RH) (See Variable Valve Timing Actuator Component Removal Note.) (See Variable Valve Timing Actuator Component Installation Note.)

Timing Chain Component Removal Note

CAUTION:

- When removing the timing chain and marking the timing marks on the chain, mark the camshaft timing chain as well.

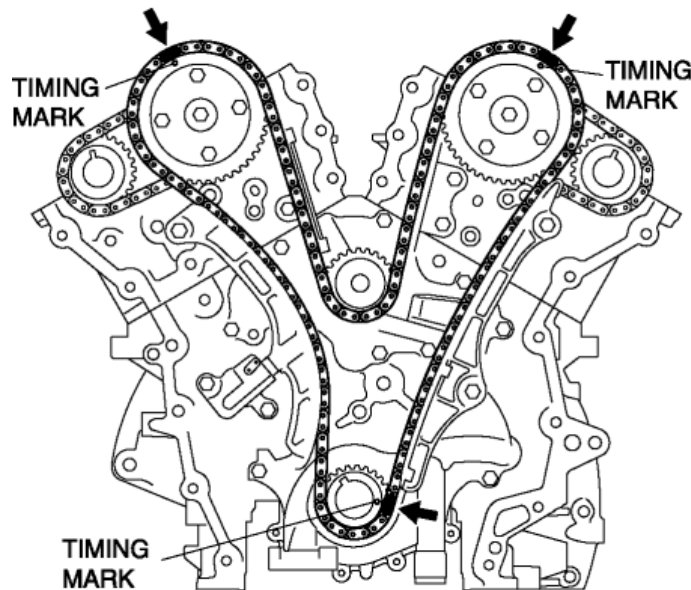
1. Turn the crankshaft clockwise so that the crankshaft keyway is in the 11 o'clock position. (This will position the No.1 cylinder at TDC.)



NOTE:

- Verify that there are timing marks in three locations (Yellow 1, Black 2) on the timing chain. If any timing marks are missing, mark the timing chain.
- When marking the crankshaft sprocket side timing chain, change the mark color.
- When the timing chain is replaced with a new one, mark the new timing chain at the same positions as the removed timing chain.

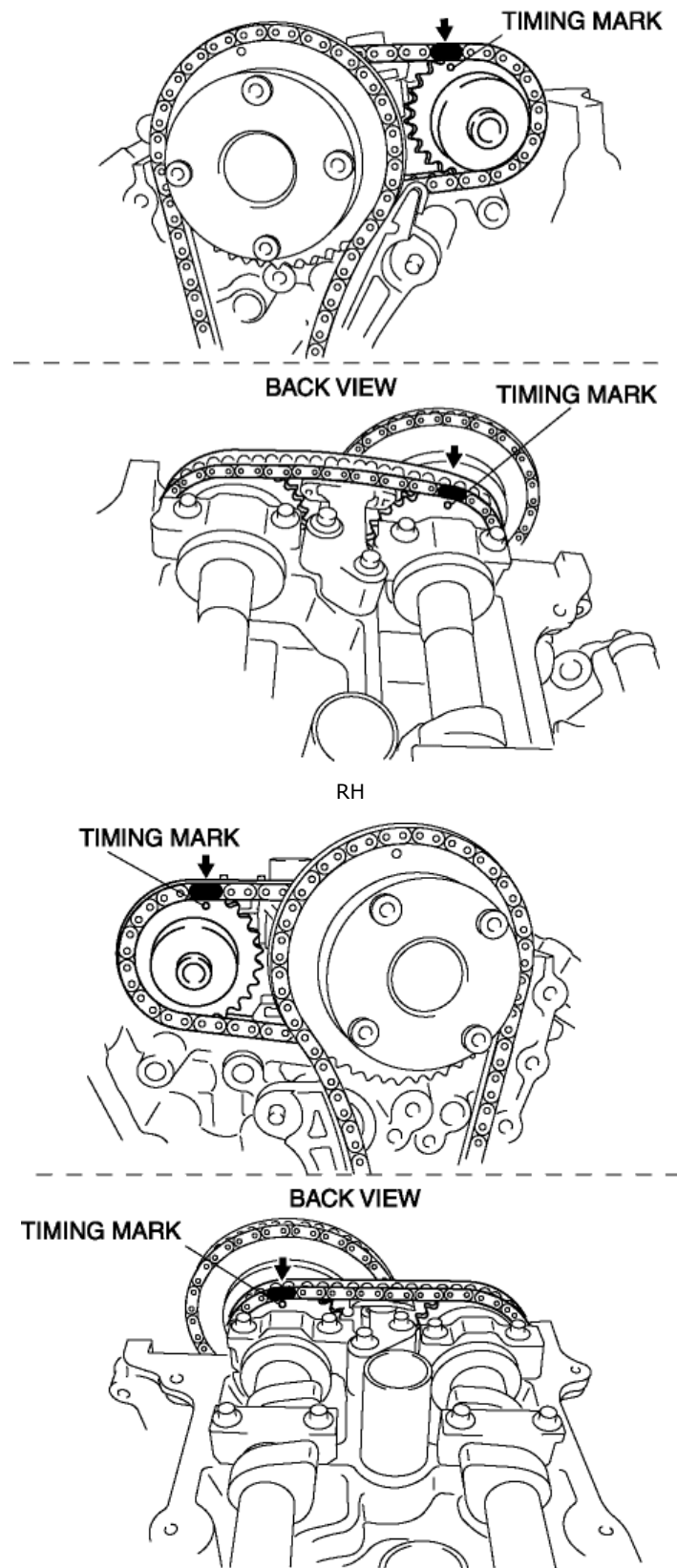
2. Mark the timing chain at the position of each timing sprocket timing mark.



NOTE:

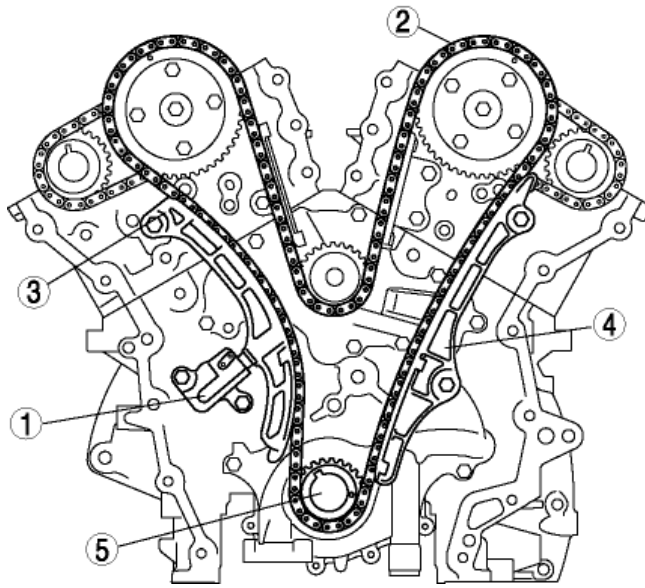
- Verify that there are timing marks in two locations on the camshaft timing chain. If any timing marks are missing, mark the camshaft timing chain.
- If replacing with a new variable valve timing actuator, place alignment marks in the same positions as those prior to the replacement.

3. Mark the camshaft timing chain at the positions where it is aligned with each of the camshaft sprocket on both banks.



4. Remove the timing chain in the following order.

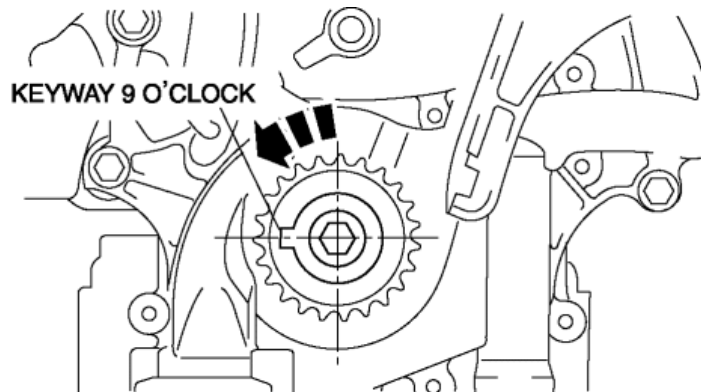
- Chain tensioner
- Timing chain
- Tensioner arm
- Chain guide
- Crankshaft sprocket



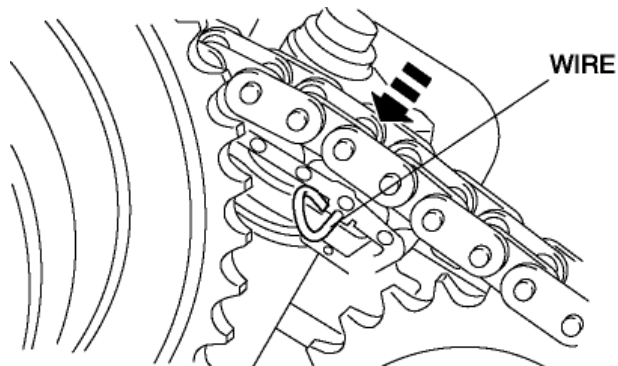
Variable Valve Timing Actuator Component Removal Note

CAUTION:

- Do not rotate the crankshaft counterclockwise. The timing chains may bind, causing engine damage.
1. Rotate the crankshaft counterclockwise until the keyway is in the 9 o'clock position.



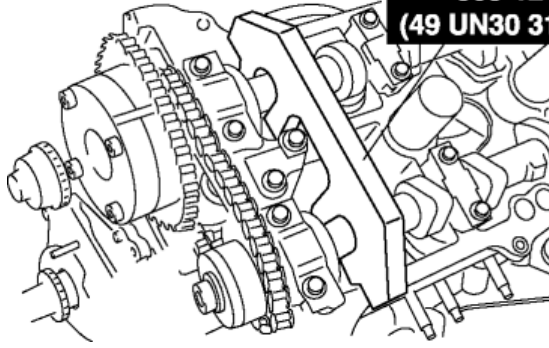
2. Slowly compress the camshaft timing chain tensioner (LH) piston by hand.
3. Insert an **approx. 1.0 mm { 0.039 in }** thin wire or paper clip into the camshaft timing chain tensioner (LH) shown in the figure to hold the tensioner piston.



NOTE:

- When the timing chain removed, valve spring pressure will rotate the camshaft (LH) approx. 3 ° to a neutral position.
4. Install the SST onto the camshafts (LH).

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(49 UN30 312480)

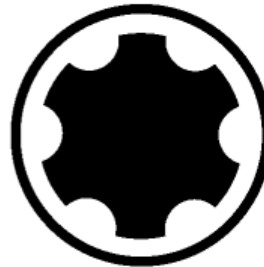


CAUTION:

- Always use an appropriate tool (TORX or TORX PLUS). If the appropriate tool is not used, it could result in damage to the bolts or the tools.



TORX



TORX PLUS

Tool size

- TORX: T55
- TORX PLUS: 55IP

NOTE:

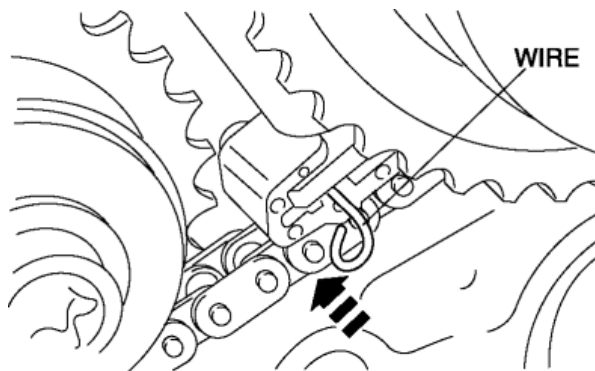
- The camshaft sprocket is integrated with the variable valve timing actuator and cannot be disassembled.

5. Remove the variable valve timing actuator, camshaft timing chain and the exhaust camshaft sprocket of the LH bank as a single unit using the appropriate tools.

6. Remove the SST from the camshafts (LH).

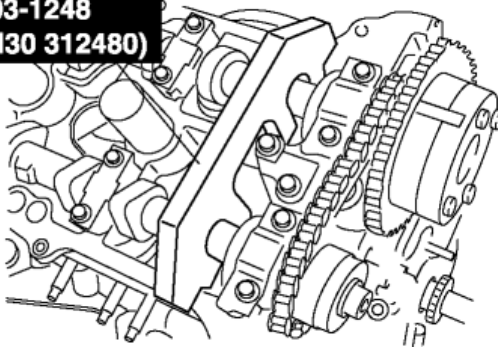
7. Slowly compress the camshaft timing chain tensioner (RH) piston by hand.

8. Insert an **approx. 1.0 mm {0.039 in}** thin wire or paper clip into the camshaft timing chain tensioner (RH) shown in the figure to hold the tensioner piston.



9. Install the SST onto the camshafts (RH).

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(49 UN30 312480)**



NOTE:

- The camshaft sprocket is integrated with the variable valve timing actuator and cannot be disassembled.

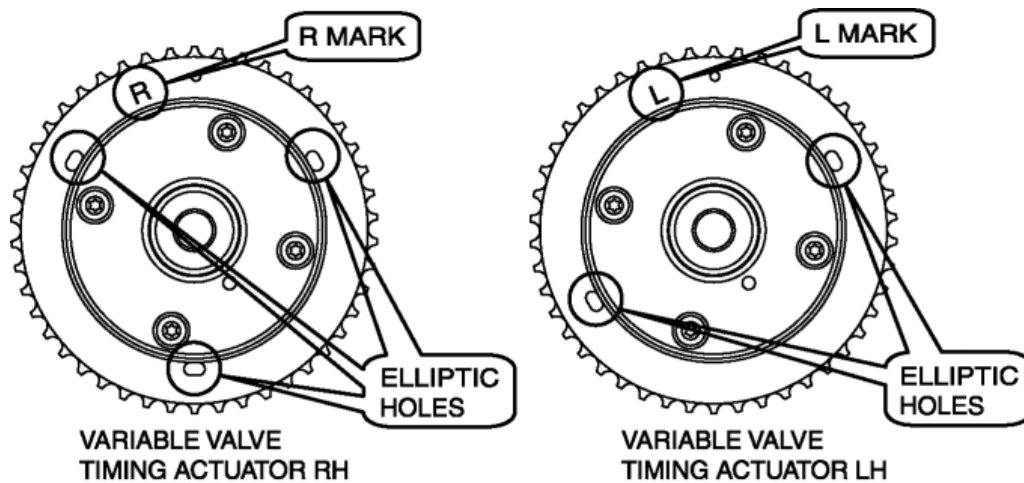
10. Remove the variable valve timing actuator, camshaft timing chain and the exhaust camshaft sprocket of the RH bank as a single unit using the appropriate tools.

11. Remove the SST from the camshafts (RH).

Variable Valve Timing Actuator Component Installation Note

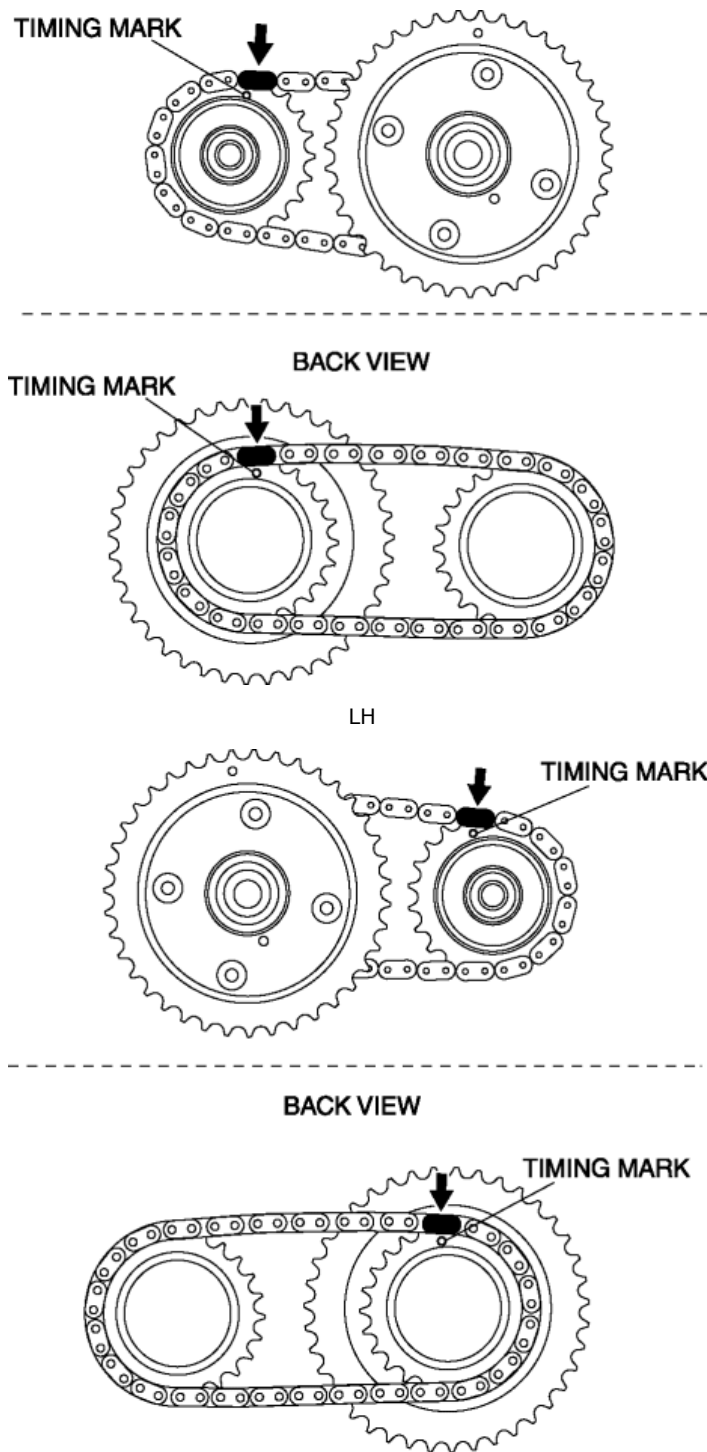
NOTE:

- Identify the variable valve timing actuator as shown in the figure.



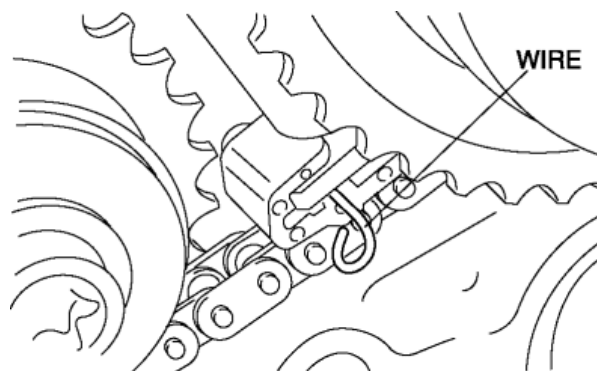
1. Align the alignment marks on the camshaft timing chain and both intake and exhaust side camshaft sprockets of both banks.

RH



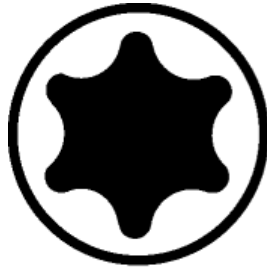
2. Install the variable valve timing actuator, camshaft timing chain and the exhaust camshaft sprocket of the RH bank as a single unit.

3. Remove the retaining wire inserted into the camshaft timing chain tensioner (RH).

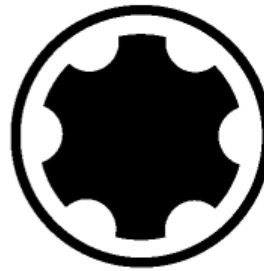


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TORX



TORX PLUS

Tool size

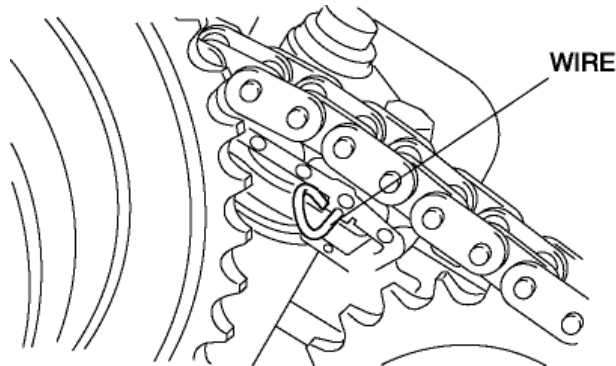
- TORX: T55
- TORX PLUS: 55IP

4. Tighten the new camshaft sprocket (RH) bolts using the appropriate tools following 4 steps.

- a. Tighten to **40 N·m { 4.1 kgf·m, 30 ft·lbf }** .
- b. Loosen **360 °** (one full turn) in reverse order.
- c. Tighten to **10 N·m { 102 kgf·cm, 89 in·lbf }** .
- d. Tighten to **90 °** .

5. Install the variable valve timing actuator, camshaft timing chain and the exhaust camshaft sprocket of the LH bank as a single unit.

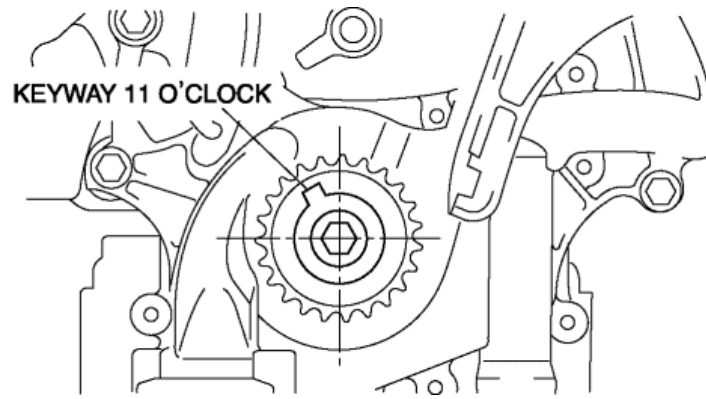
6. Remove the retaining wire inserted into the camshaft timing chain tensioner (LH).



7. Tighten the new camshaft sprocket (LH) bolts using the appropriate tools following 4 steps.

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8. Turn the crankshaft clockwise so that the crankshaft keyway is in the 11 o'clock position. (This will position the No.1 cylinder at TDC.)



9. Follow the "TIMING CHAIN REMOVAL/INSTALLATION" procedure and install the timing chain. (See [TIMING CHAIN REMOVAL/INSTALLATION \[MZI 3.7 V6\]](#).)

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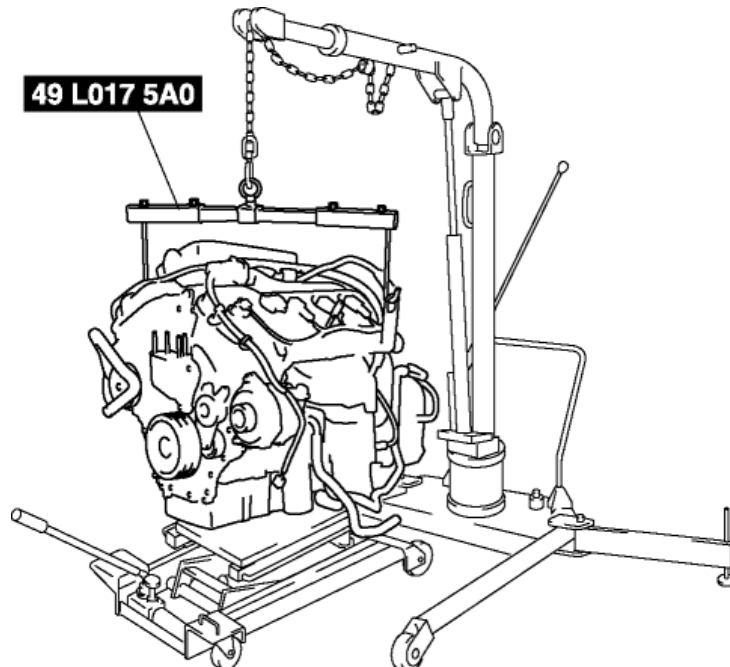
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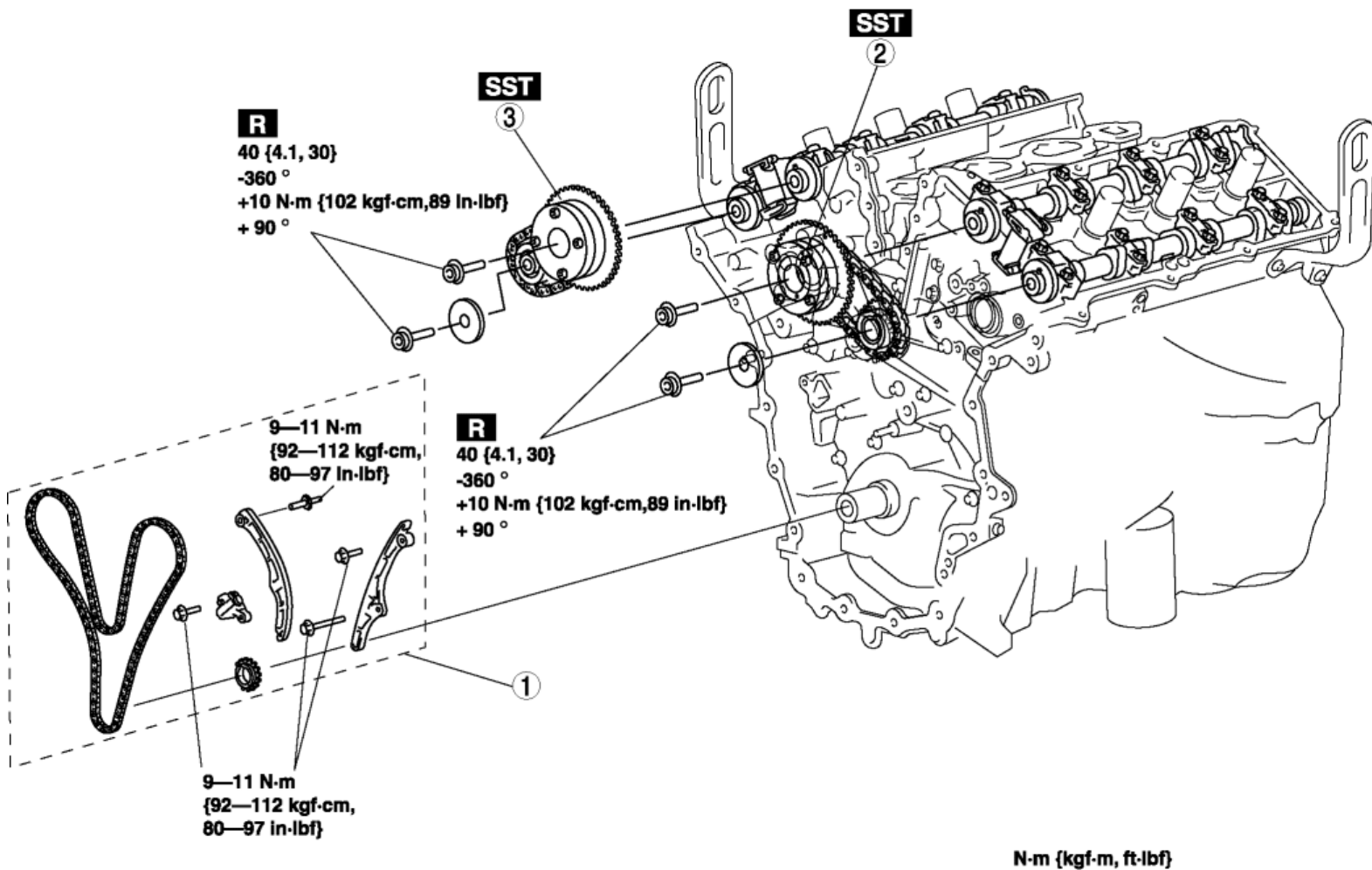
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4. Remove the dynamic chamber and throttle body as a single unit. (See [INTAKE-AIR SYSTEM REMOVAL/ INSTALLATION \[MZI 3.7 V6\]](#).)
5. Remove the ignition coils. (See [IGNITION COIL REMOVAL/ INSTALLATION \[MZI 3.7 V6\]](#).)
6. Remove the dipstick.
7. Remove the power steering oil pump drive belt. (See [DRIVE BELT REMOVAL/ INSTALLATION \[MZI 3.7 V6\]](#).)
8. Remove the power steering oil pump. (See [POWER STEERING OIL PUMP REMOVAL/ INSTALLATION \[MZI 3.7 V6\]](#).)
9. Remove in the order indicated in the table.

10. Install in the reverse order of removal.
11. Start the engine and:
 - a. Inspect the runout and contact on the pulley and belt.
 - b. Inspect for engine oil, engine coolant, ATF, power steering fluid and fuel leakage.
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12. Perform a road test.



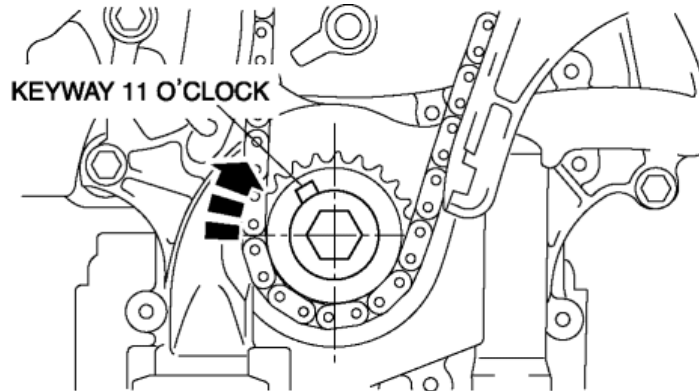
1	Timing chain component (See Timing Chain Component Removal Note.) (See Variable Valve Timing Actuator Component Installation Note.)
2	Variable valve timing actuator component (LH) (See Variable Valve Timing Actuator Component Removal Note.) (See Variable Valve Timing Actuator Component Installation Note.)
3	Variable valve timing actuator component (RH) (See Variable Valve Timing Actuator Component Removal Note.) (See Variable Valve Timing Actuator Component Installation Note.)

Timing Chain Component Removal Note

CAUTION:

- When removing the timing chain and marking the timing marks on the chain, mark the camshaft timing chain as well.

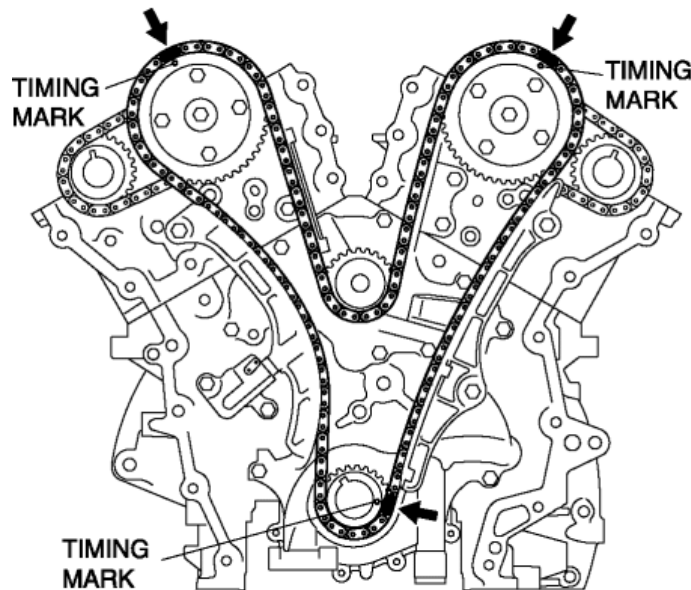
1. Turn the crankshaft clockwise so that the crankshaft keyway is in the 11 o'clock position. (This will position the No.1 cylinder at TDC.)



NOTE:

- Verify that there are timing marks in three locations (Yellow 1, Black 2) on the timing chain. If any timing marks are missing, mark the timing chain.
- When marking the crankshaft sprocket side timing chain, change the mark color.
- When the timing chain is replaced with a new one, mark the new timing chain at the same positions as the removed timing chain.

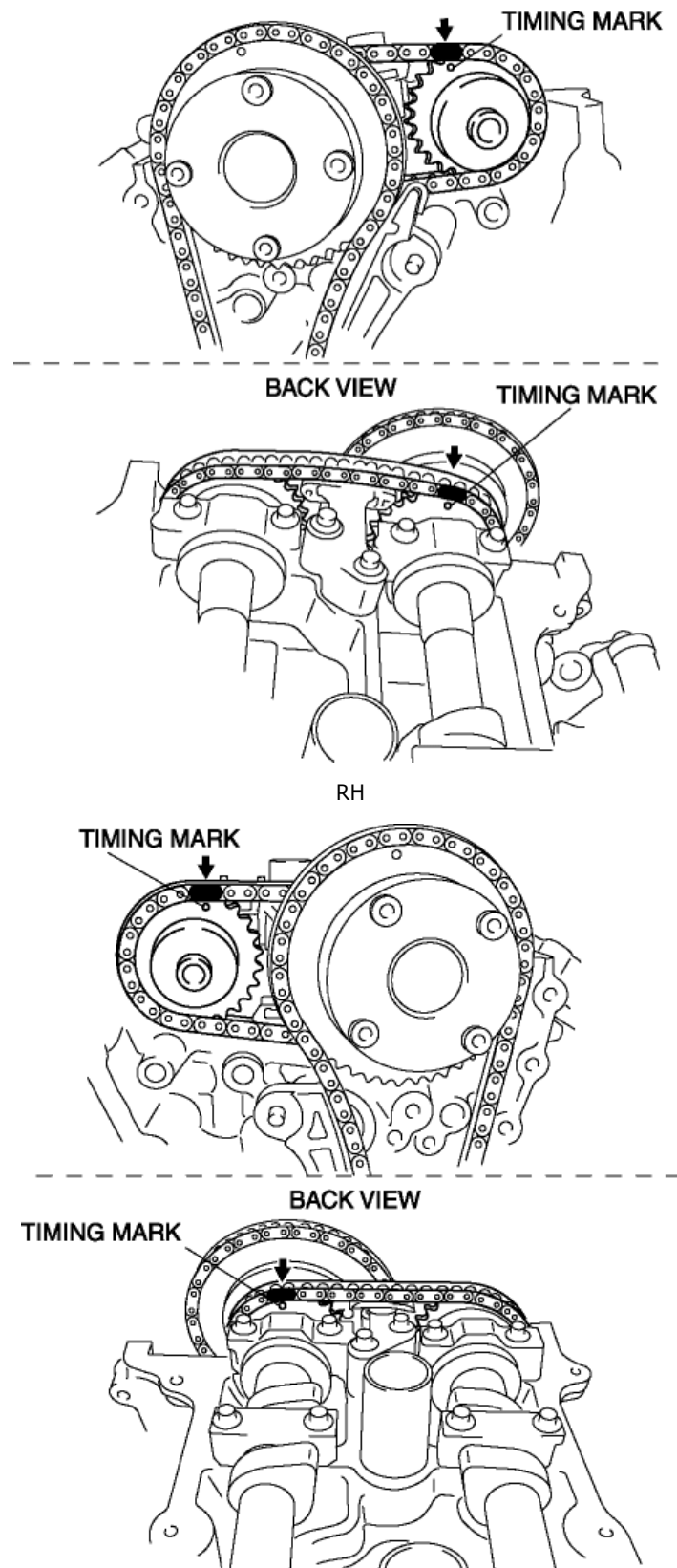
2. Mark the timing chain at the position of each timing sprocket timing mark.



NOTE:

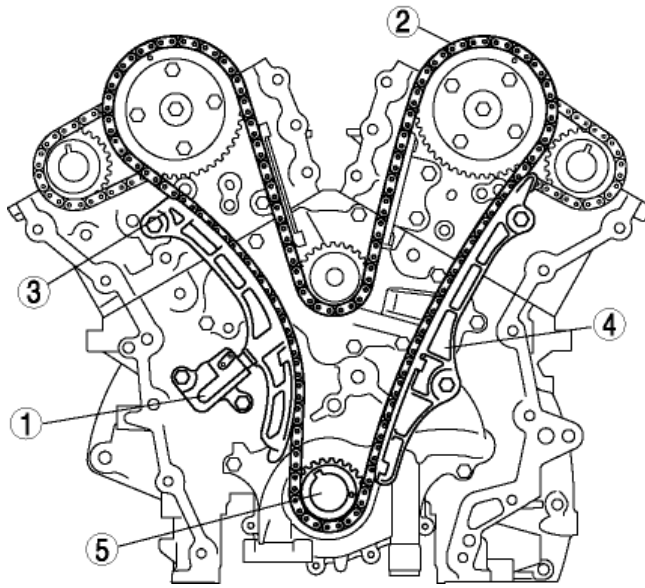
- Verify that there are timing marks in two locations on the camshaft timing chain. If any timing marks are missing, mark the camshaft timing chain.
- If replacing with a new variable valve timing actuator, place alignment marks in the same positions as those prior to the replacement.

3. Mark the camshaft timing chain at the positions where it is aligned with each of the camshaft sprocket on both banks.



4. Remove the timing chain in the following order.

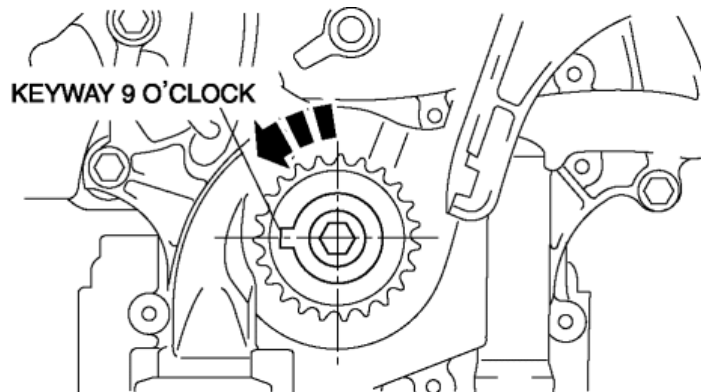
- Chain tensioner
- Timing chain
- Tensioner arm
- Chain guide
- Crankshaft sprocket



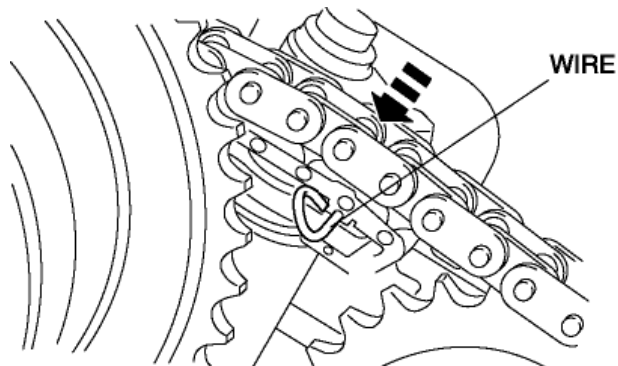
Variable Valve Timing Actuator Component Removal Note

CAUTION:

- Do not rotate the crankshaft counterclockwise. The timing chains may bind, causing engine damage.
1. Rotate the crankshaft counterclockwise until the keyway is in the 9 o'clock position.



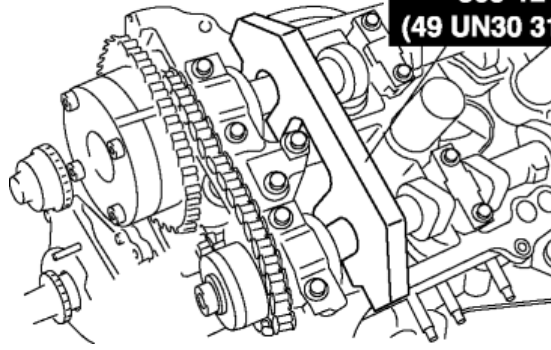
2. Slowly compress the camshaft timing chain tensioner (LH) piston by hand.
3. Insert an **approx. 1.0 mm { 0.039 in }** thin wire or paper clip into the camshaft timing chain tensioner (LH) shown in the figure to hold the tensioner piston.



NOTE:

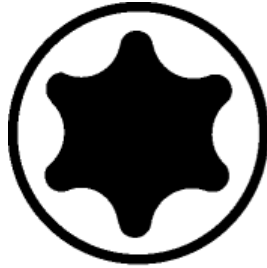
- When the timing chain removed, valve spring pressure will rotate the camshaft (LH) approx. 3 ° to a neutral position.
4. Install the SST onto the camshafts (LH).

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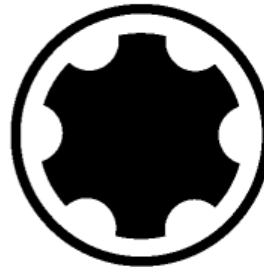


CAUTION:

- Always use an appropriate tool (TORX or TORX PLUS). If the appropriate tool is not used, it could result in damage to the bolts or the tools.



TORX



TORX PLUS

Tool size

- TORX: T55
- TORX PLUS: 55IP

NOTE:

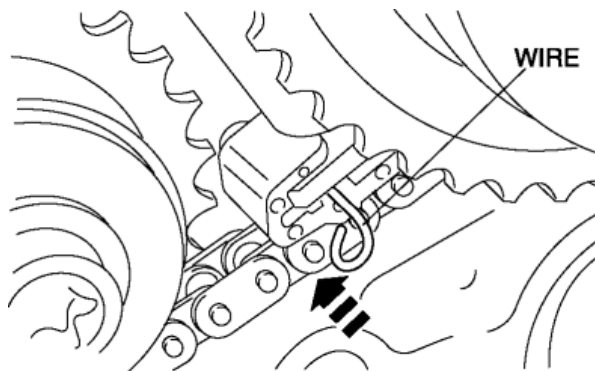
- The camshaft sprocket is integrated with the variable valve timing actuator and cannot be disassembled.

5. Remove the variable valve timing actuator, camshaft timing chain and the exhaust camshaft sprocket of the LH bank as a single unit using the appropriate tools.

6. Remove the SST from the camshafts (LH).

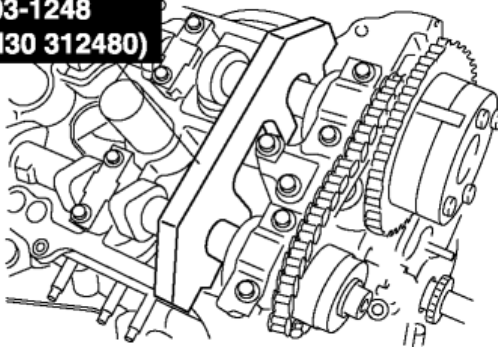
7. Slowly compress the camshaft timing chain tensioner (RH) piston by hand.

8. Insert an **approx. 1.0 mm {0.039 in}** thin wire or paper clip into the camshaft timing chain tensioner (RH) shown in the figure to hold the tensioner piston.



9. Install the SST onto the camshafts (RH).

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NOTE:

- The camshaft sprocket is integrated with the variable valve timing actuator and cannot be disassembled.

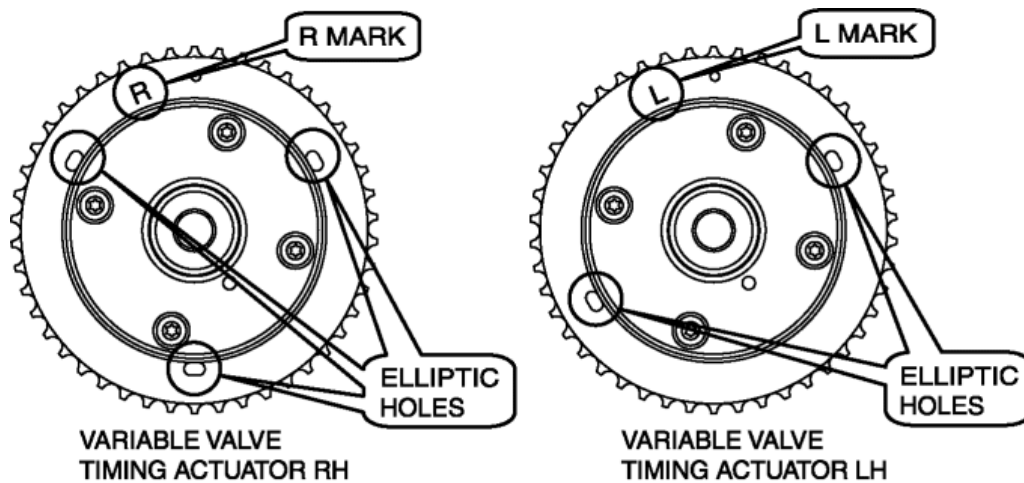
10. Remove the variable valve timing actuator, camshaft timing chain and the exhaust camshaft sprocket of the RH bank as a single unit using the appropriate tools.

11. Remove the SST from the camshafts (RH).

Variable Valve Timing Actuator Component Installation Note

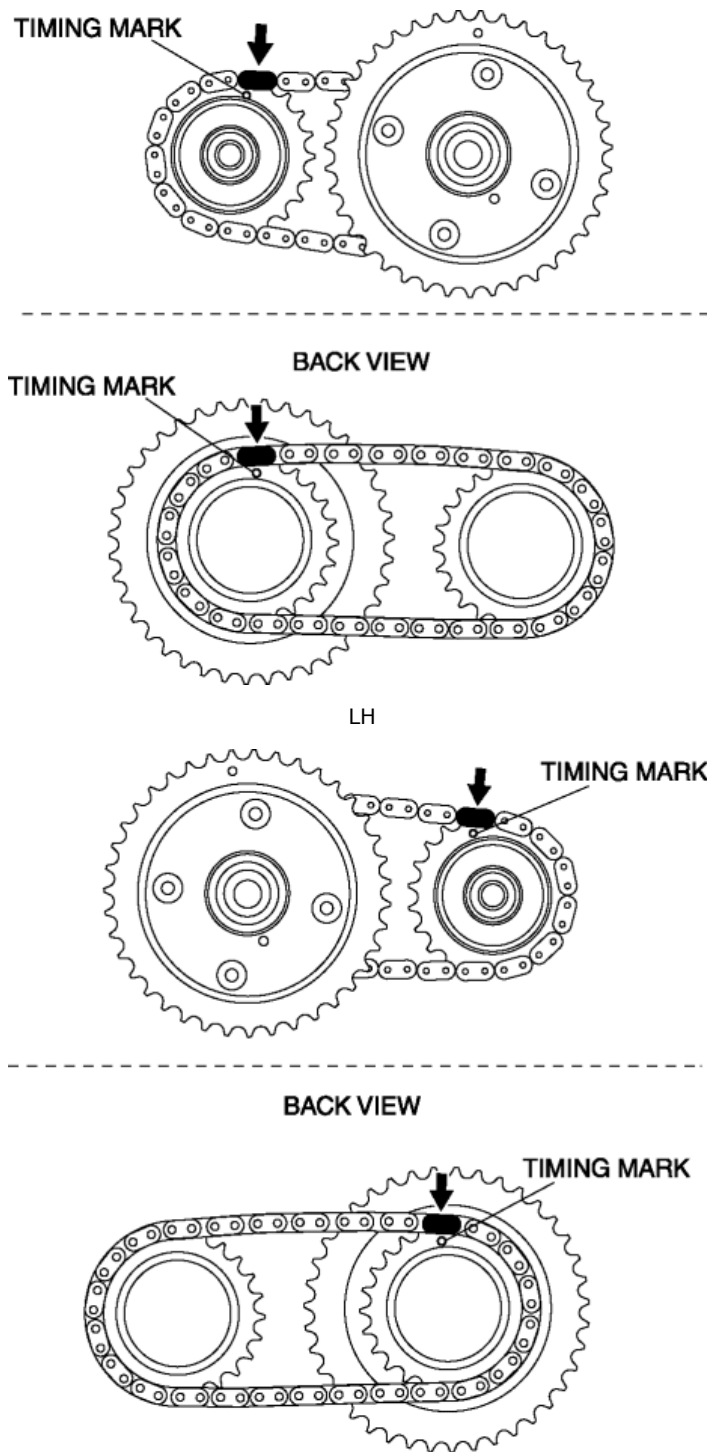
NOTE:

- Identify the variable valve timing actuator as shown in the figure.

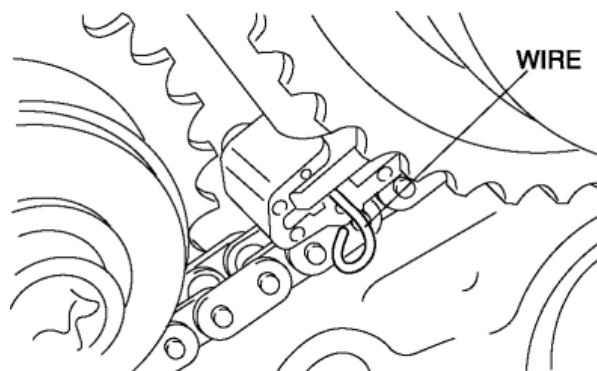


1. Align the alignment marks on the camshaft timing chain and both intake and exhaust side camshaft sprockets of both banks.

RH

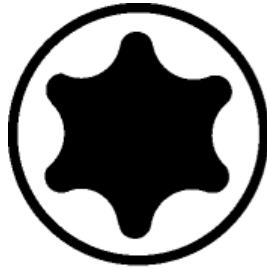


2. Install the variable valve timing actuator, camshaft timing chain and the exhaust camshaft sprocket of the RH bank as a single unit.
3. Remove the retaining wire inserted into the camshaft timing chain tensioner (RH).

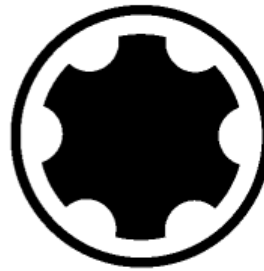


CAUTION:

- Always use an appropriate tool (TORX or TORX PLUS). If the appropriate tool is not used, it could result in damage to the bolts or the tools.



TORX



TORX PLUS

Tool size

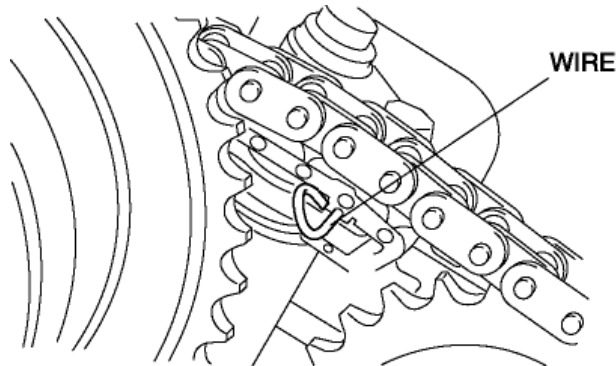
- TORX: T55
- TORX PLUS: 55IP

4. Tighten the new camshaft sprocket (RH) bolts using the appropriate tools following 4 steps.

- a. Tighten to **40 N·m { 4.1 kgf·m, 30 ft·lbf }** .
- b. Loosen **360 °** (one full turn) in reverse order.
- c. Tighten to **10 N·m { 102 kgf·cm, 89 in·lbf }** .
- d. Tighten to **90 °** .

5. Install the variable valve timing actuator, camshaft timing chain and the exhaust camshaft sprocket of the LH bank as a single unit.

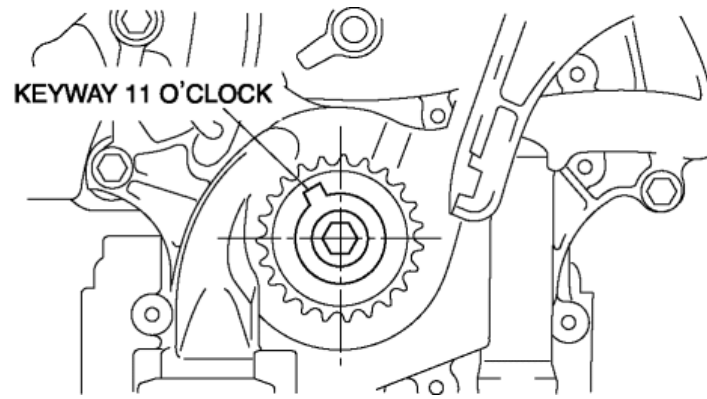
6. Remove the retaining wire inserted into the camshaft timing chain tensioner (LH).



7. Tighten the new camshaft sprocket (LH) bolts using the appropriate tools following 4 steps.

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- b. Loosen **360 °** (one full turn) in reverse order.
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8. Turn the crankshaft clockwise so that the crankshaft keyway is in the 11 o'clock position. (This will position the No.1 cylinder at TDC.)



9. Follow the "TIMING CHAIN REMOVAL/INSTALLATION" procedure and install the timing chain. (See [TIMING CHAIN REMOVAL/INSTALLATION \[MZI 3.7 V6\]](#).)

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