

2012 - Mazda6 - Engine

CYLINDER HEAD GASKET REPLACEMENT [MZI 3.7 V6]

WARNING:

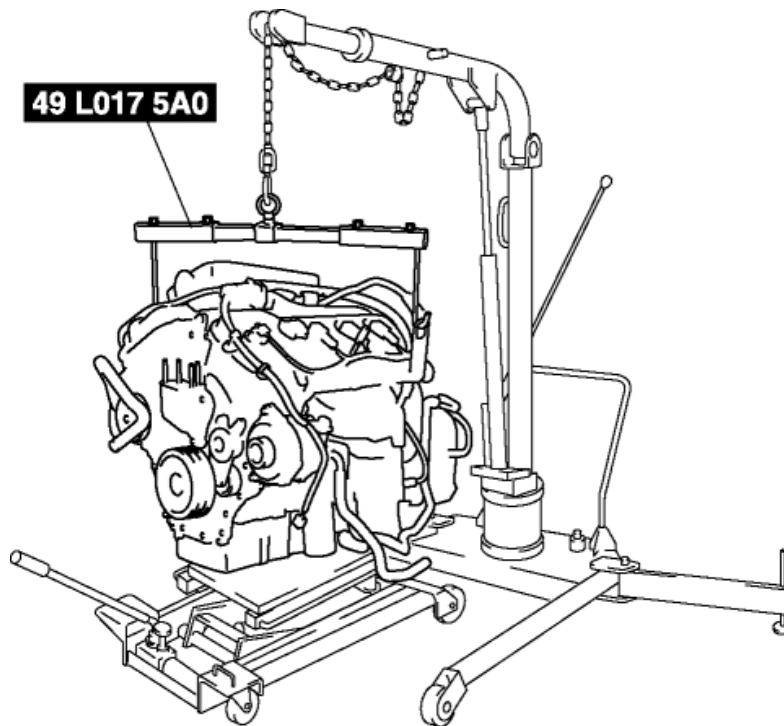
- Fuel vapor is hazardous. It can very easily ignite, causing serious injury and damage. Always keep sparks and flames away from fuel.
- Fuel line spills and leakage are dangerous. Fuel can ignite and cause serious injuries or death and damage. Fuel can also irritate skin and eyes. To prevent this, always 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.

NOTE:

- The following procedure "CYLINDER HEAD GASKET REPLACEMENT" 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 fuel injector and fuel distributor together as a single unit. (See [FUEL INJECTOR REMOVAL/ INSTALLATION \[MZI 3.7 V6\]](#).)
6. Remove the thermostat and thermostat housing together as a single unit. (See [THERMOSTAT REMOVAL/ INSTALLATION \[MZI 3.7 V6\]](#).)

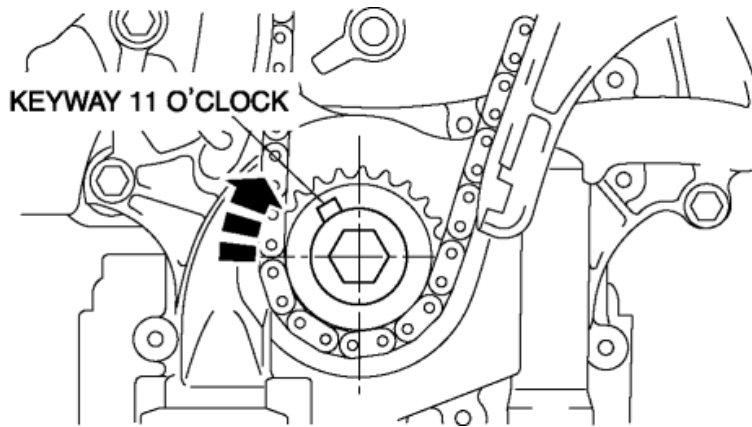
7. Remove the Intake manifold. (See **INTAKE-AIR SYSTEM REMOVAL/ INSTALLATION [MZI 3.7 V6] .**)
8. Remove both WU-TWCs together with both exhaust manifolds as a single unit. (See **EXHAUST SYSTEM REMOVAL/ INSTALLATION [MZI 3.7 V6] .**)
9. Remove the ignition coils. (See **IGNITION COIL REMOVAL/ INSTALLATION [MZI 3.7 V6] .**)
10. Remove the dipstick.
11. Remove the power steering oil pump drive belt. (See **DRIVE BELT REMOVAL/ INSTALLATION [MZI 3.7 V6] .**)
12. Remove the power steering oil pump. (See **POWER STEERING OIL PUMP REMOVAL/ INSTALLATION [MZI 3.7 V6] .**)
13. Remove the generator. (See **GENERATOR REMOVAL/ INSTALLATION [MZI 3.7 V6] .**)
14. Remove the OCV component (LH) (RH). (See **TIMING CHAIN REMOVAL/ INSTALLATION [MZI 3.7 V6] .**)
15. Remove in the order indicated in the table.
16. Install in the reverse order of removal.
17. 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.
18. Perform a road test.

	(See Camshaft Component Installation Note.)
4	Camshaft timing chain (LH) (See Camshaft Component Removal Note.) (See Camshaft Component Installation Note.)
5	Camshaft component (LH) (See Camshaft Component Removal Note.) (See Camshaft Component Installation Note.)
6	Camshaft cap (RH) (See Camshaft Component Removal Note.) (See Camshaft Component Installation Note.)
7	Camshaft timing chain tensioner (RH) (See Camshaft Component Removal Note.) (See Camshaft Component Installation Note.)
8	Camshaft timing chain (RH) (See Camshaft Component Removal Note.) (See Camshaft Component Installation Note.)
9	Camshaft component (RH) (See Camshaft Component Removal Note.) (See Camshaft Component Installation Note.)
10	Cylinder head (LH) (See Cylinder Head Removal Note.) (See Cylinder Head Installation Note.)
11	Cylinder head gasket (LH)
12	Cylinder head (RH) (See Cylinder Head Removal Note.) (See Cylinder Head Installation Note.)
13	Cylinder head gasket (RH)

Timing Chain Component Removal Note

CAUTION:

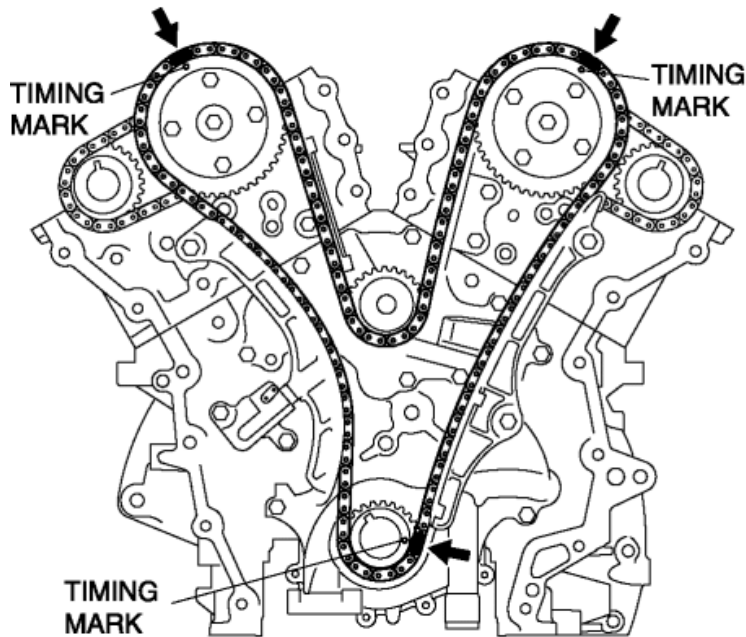
- When removing the timing chain and marking the timing marks on the chain, mark the camshaft timing chain as well.
1. Turn the crankshaft clockwise so that the crankshaft keyway is in the 11 o'clock position. (This will position the No.1 cylinder at TDC.)



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.

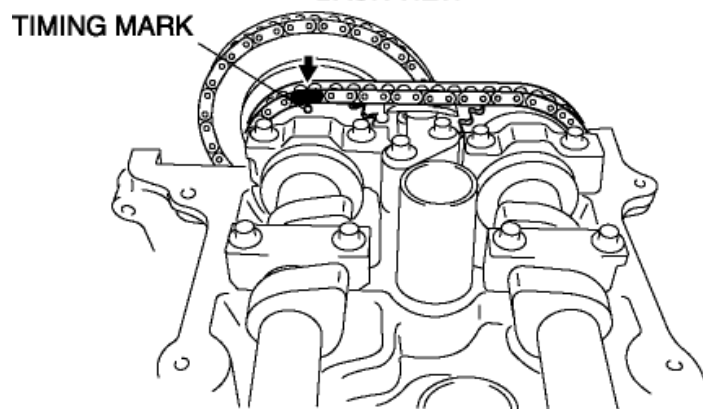
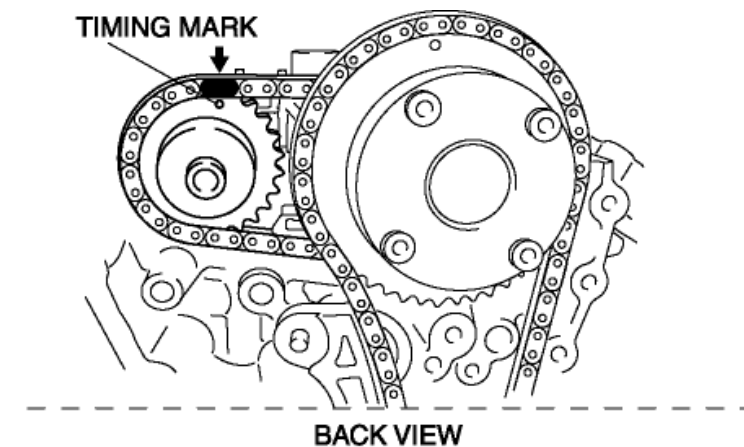
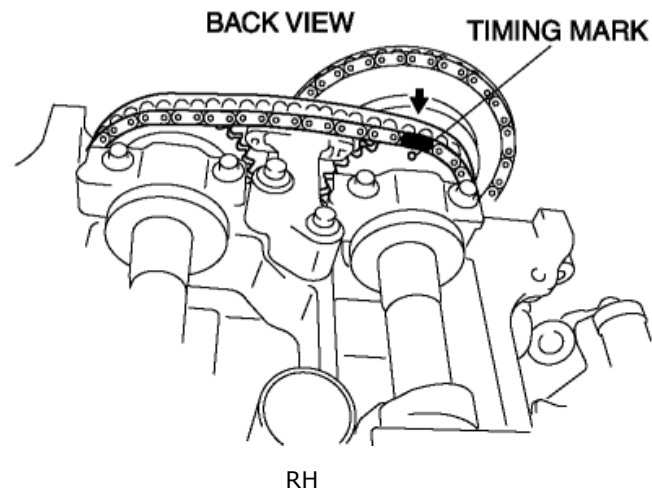
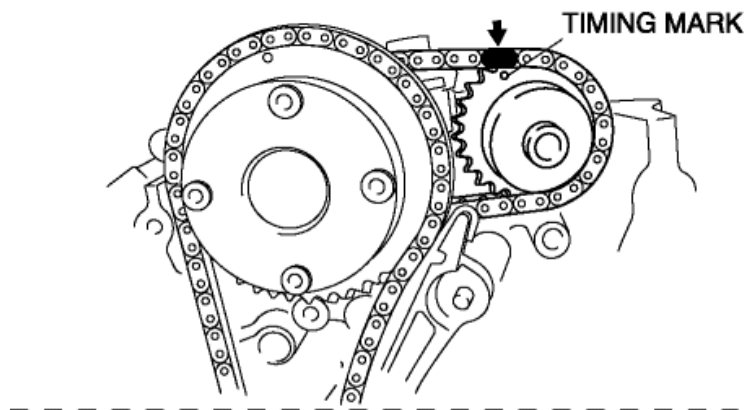
2. Mark the timing chain at the position of each timing sprocket timing mark.



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.

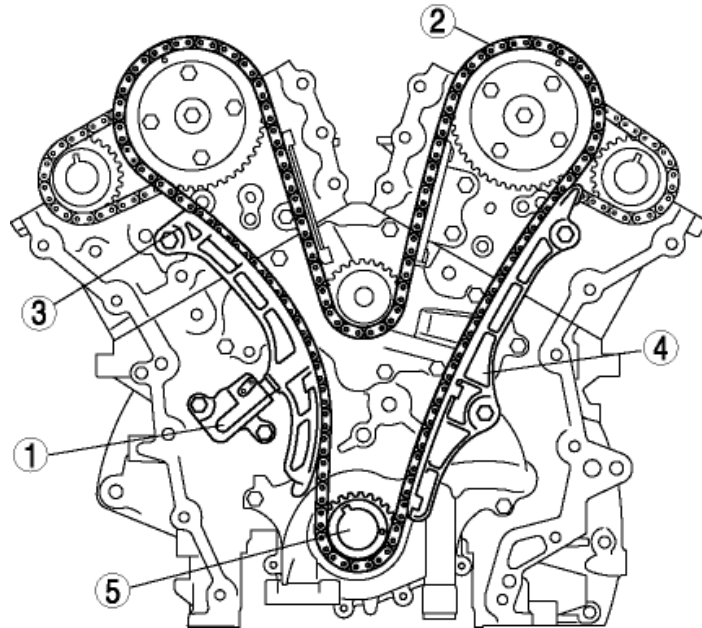
3. Mark the camshaft timing chain at the positions where it is aligned with each of the camshaft sprocket on both banks.



4. Remove the timing chain in the following order.

- a. Chain tensioner
- b. Timing chain

- c. Tensioner arm
- d. Chain guide
- e. Crankshaft sprocket

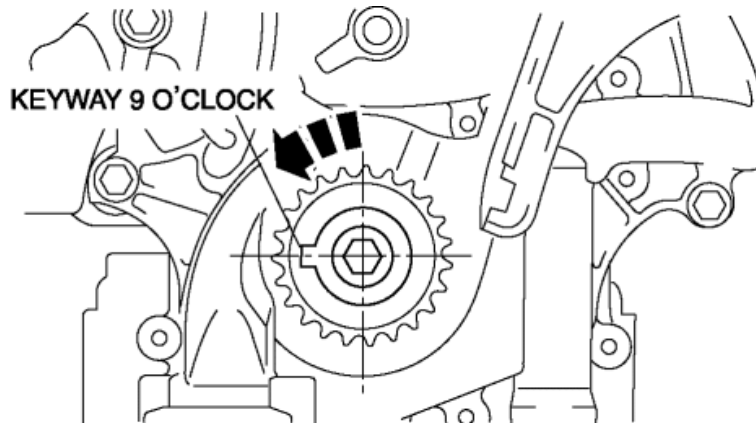


Camshaft Component Removal Note

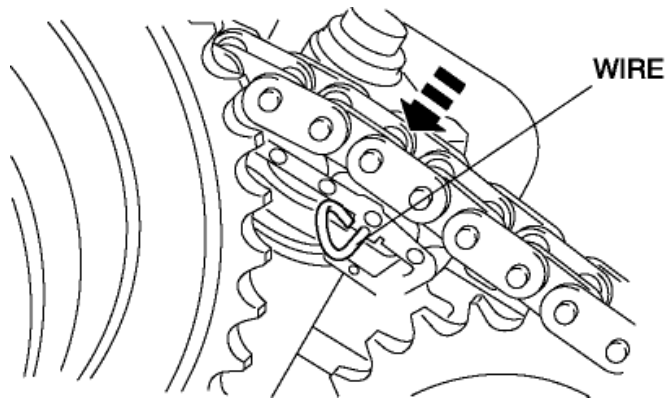
CAUTION:

- 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.

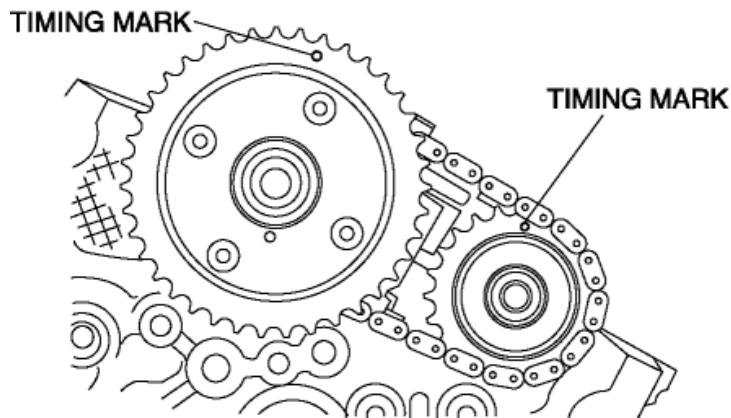


2. Slowly compress the camshaft timing chain tensioner (LH) piston by hand.
3. Insert an **approx. 1.0 mm { 0.039 in }** thin wire or paper clip into the camshaft timing chain tensioner (LH) shown in the figure to hold the tensioner piston.



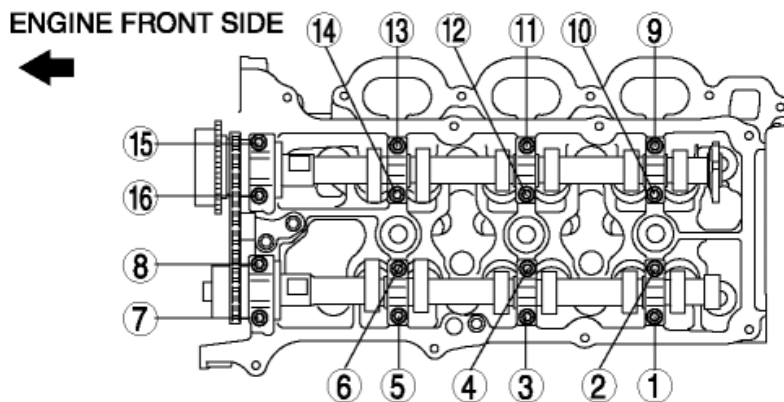
NOTE:

- When the timing chain removed, valve spring pressure will rotate the camshaft (LH) approx. 3 ° to a neutral position.
4. Verify that the camshafts (LH) are in the neutral position.

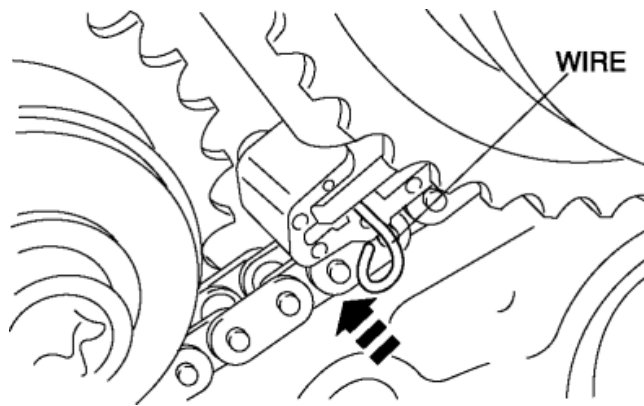


NOTE:

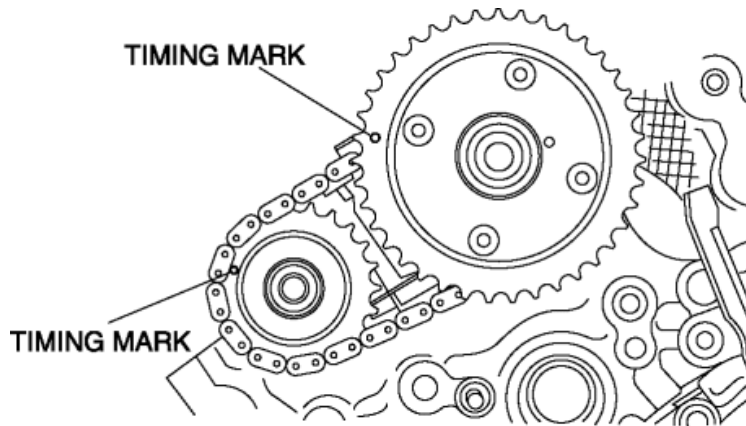
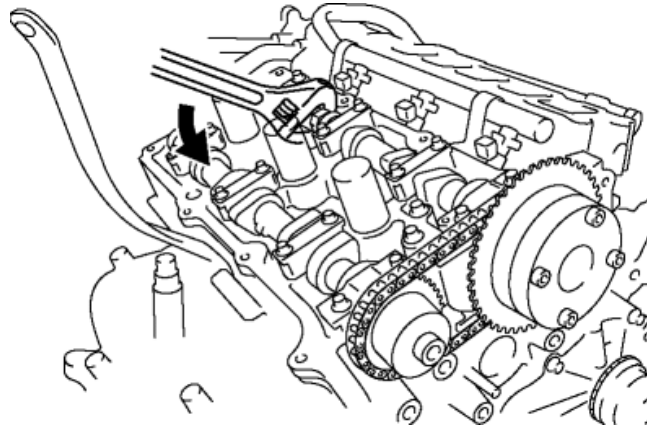
- The cylinder head and the camshaft bearing caps are numbered to make sure they are reassembled in their original position. When removed, keep the bearing caps with the cylinder head they were removed from. Do not mix the caps.
5. Loosen the LH bank camshaft cap bolts in several passes in the order shown in the figure and remove the camshaft cap.



6. Remove the camshaft, camshaft sprocket, camshaft timing chain, and camshaft timing chain tensioner of the LH bank as a single unit.
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. Put a wrench to the position shown in the figure on the RH bank camshaft, rotate the RH bank camshaft counterclockwise, and set the camshaft to the neutral position.

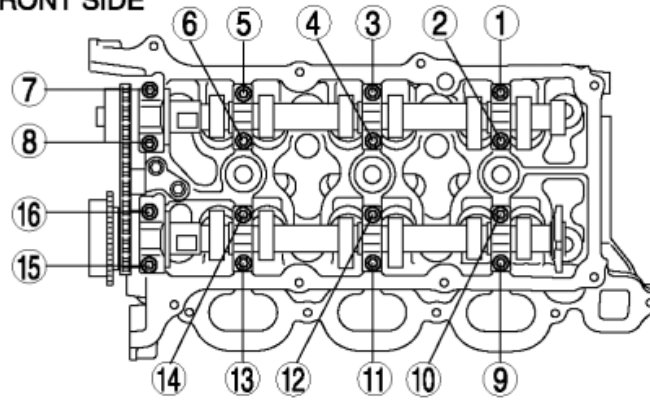


NOTE:

- The cylinder head and the camshaft bearing caps are numbered to make sure they are reassembled in their original position. When removed, keep the bearing caps with the cylinder head they were removed from. Do not mix the caps.

10. Loosen the RH bank camshaft cap bolts in several passes in the order shown in the figure and remove the camshaft cap.

ENGINE FRONT SIDE

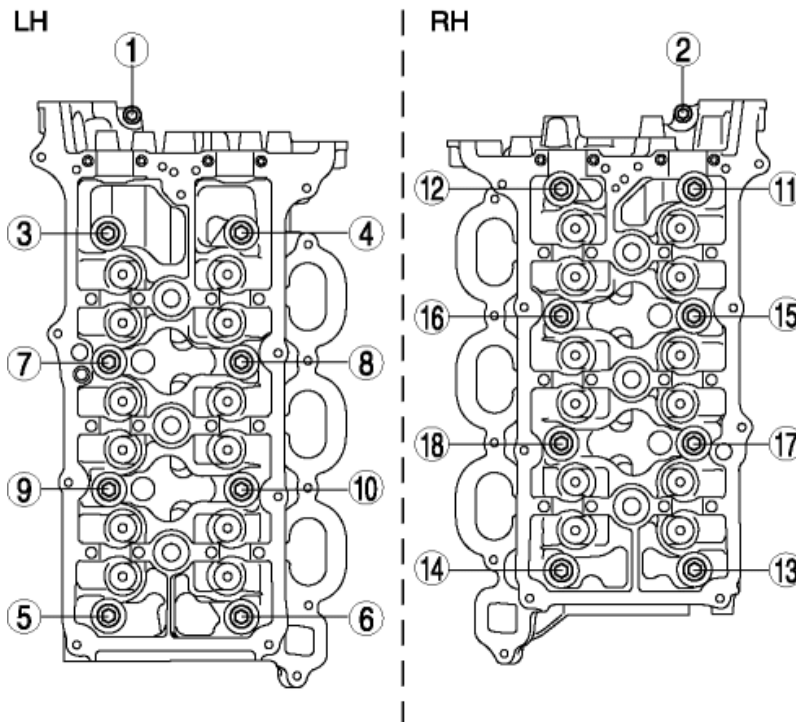


11. Remove the camshaft, camshaft sprocket, camshaft timing chain, and camshaft timing chain tensioner of the RH bank as a single unit.

Cylinder Head Removal Note

1. Loosen the cylinder head bolts in several passes in the order shown.

ENGINE FRONT SIDE

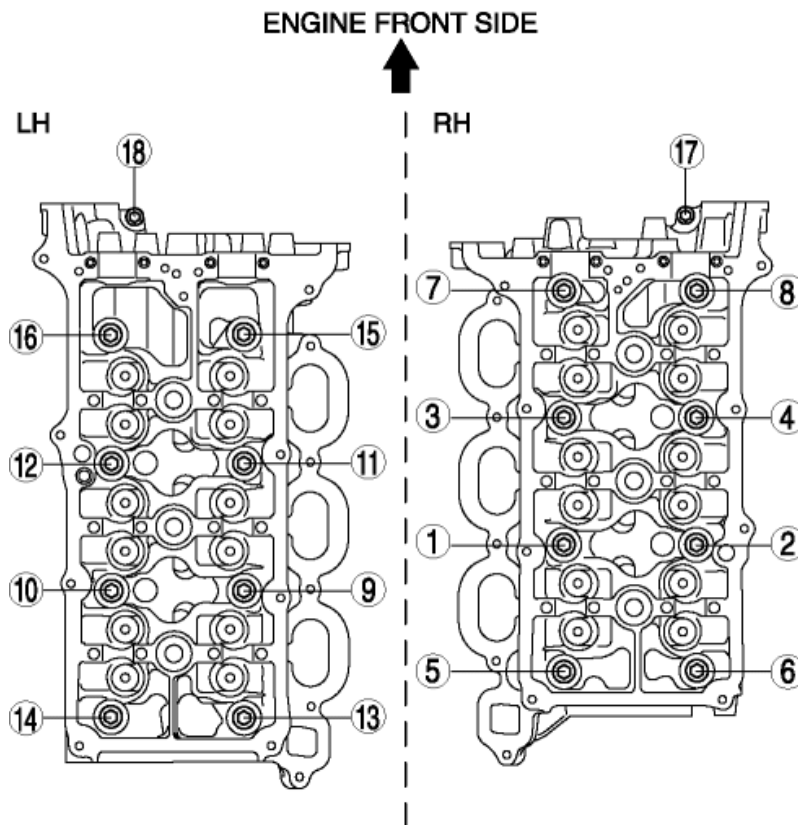


Cylinder Head Installation Note

NOTE:

- The cylinder head bolts must be replaced with new bolts. The bolts are torque-to-yield designed and cannot be reused.

1. Tighten the cylinder head bolts in the order in 6 steps in the order shown in the figure.



Tightening torque

Step	Installation position	Tightening torque
1	1—16	20 N·m {2.0 kgf·m, 15 ft·lbf}
2	1—16	35 N·m {3.6 kgf·m, 26 ft·lbf}
3	1—16	90 °
4	1—16	90 °
5	1—16	90 °
6	17, 18	9—11 N·m {92—112 kgf·cm, 80—97 in·lbf}

Camshaft Component Installation Note

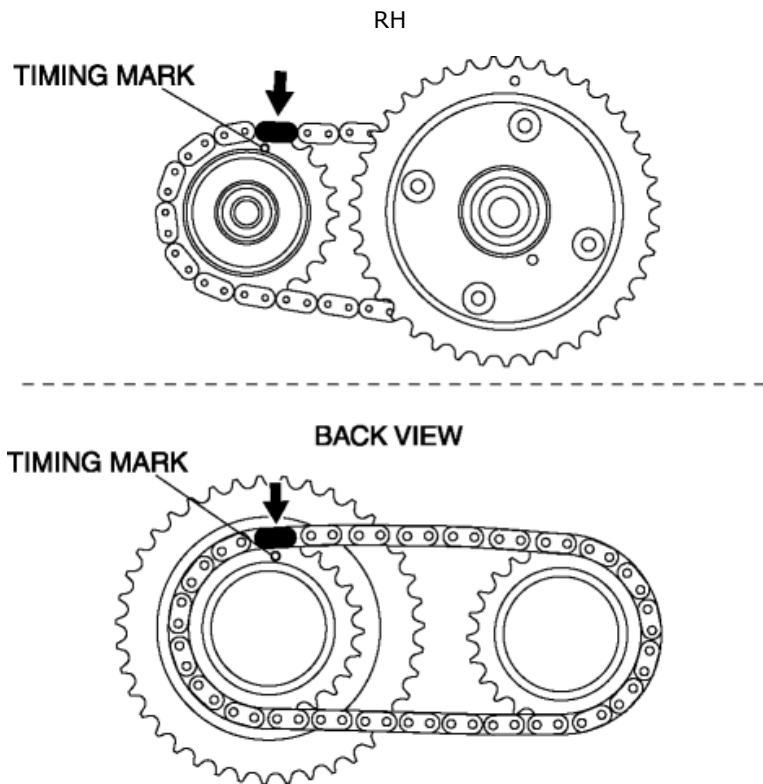
1. Assemble the camshaft timing chain tensioners on both sides.

Tightening torque

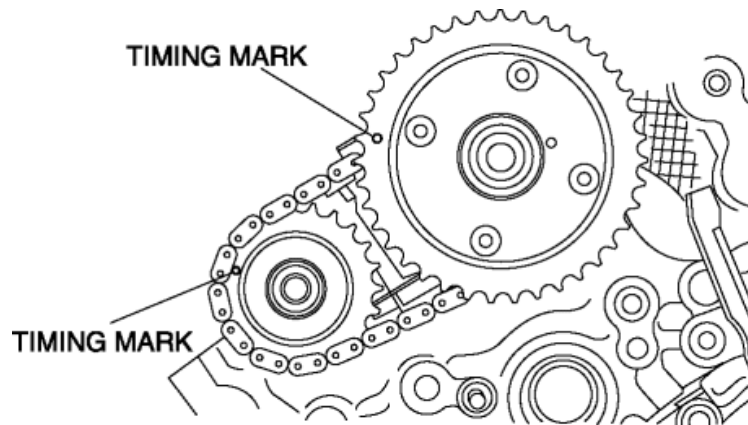
- 9—11 N·m {92—112 kgf·cm, 80—97 in·lbf}

NOTE:

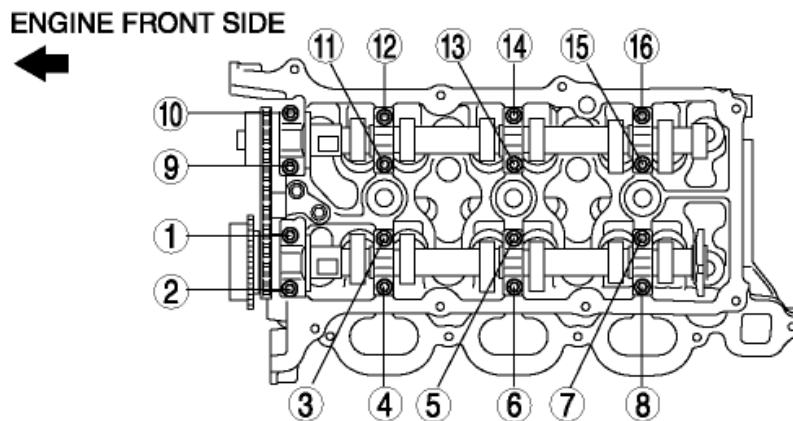
- Install the camshaft, camshaft sprocket and camshaft timing chain of the both bank as a single unit.
2. Install the camshaft component (RH).
 - a. Install the camshaft timing chain by aligning the colored links on the camshaft timing chain with the marks on the camshaft sprockets (RH).



b. Position the camshaft component onto the cylinder head (RH) in the neutral position as shown.



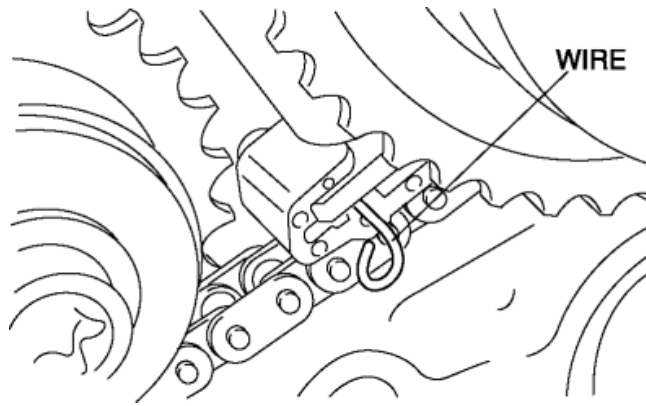
c. Install the RH bank camshaft caps and temporarily tighten the camshaft cap bolts evenly in the order shown in several passes.



Tightening torque

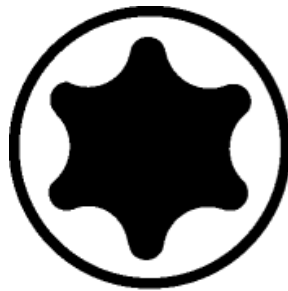
- 9—11 N·m {92—112 kgf·cm, 80—97 in·lbf}

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

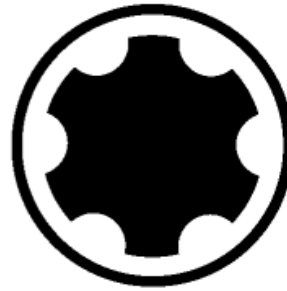


CAUTION:

- 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

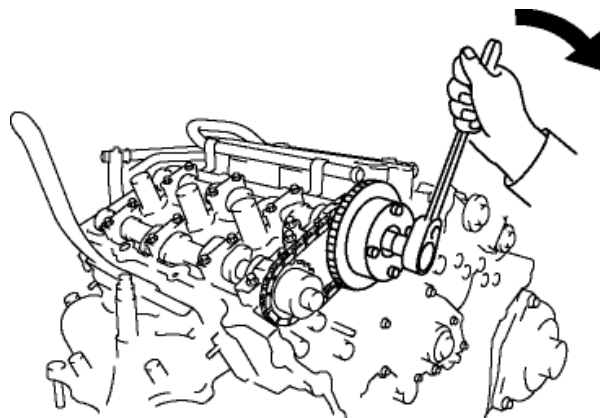


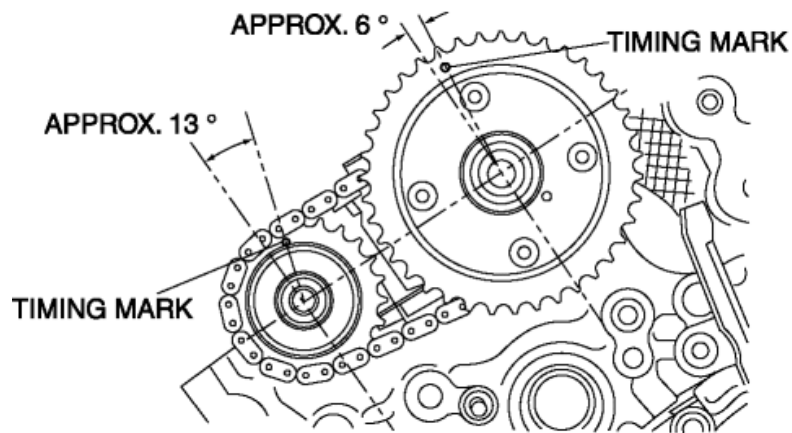
TORX PLUS

Tool size

- TORX: T55
- TORX PLUS: 55IP

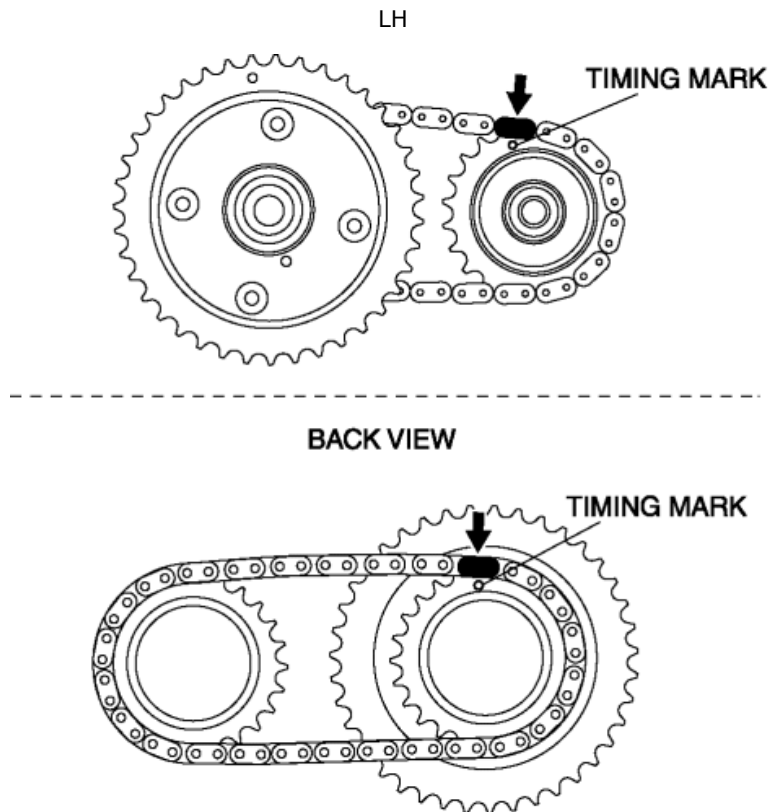
e. Using the RH bank camshaft sprocket bolt at the position shown in the figure, rotate the RH bank camshaft clockwise using the appropriate tools.



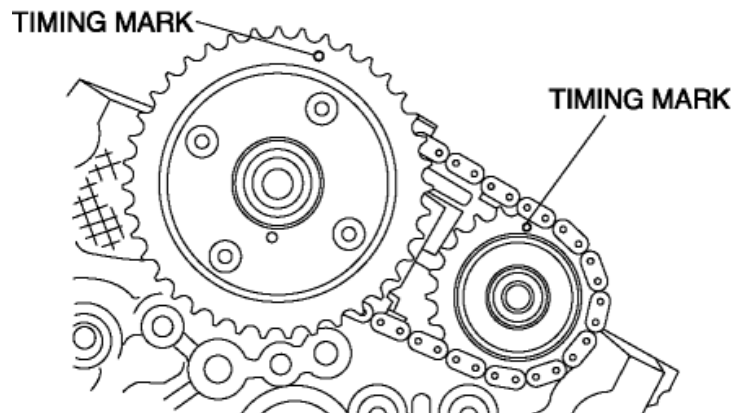


3. Install the camshaft component (LH).

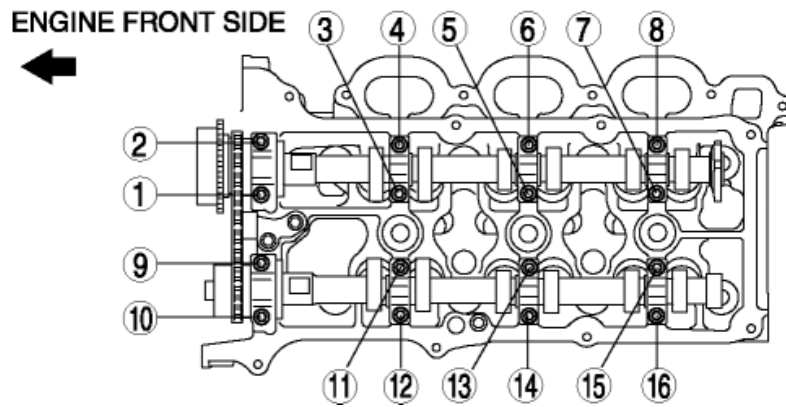
- Install the camshaft timing chain by aligning the colored links on the camshaft timing chain with the marks on the camshaft sprockets (LH).



- Position the camshafts onto the cylinder head (LH) in the neutral position as shown.



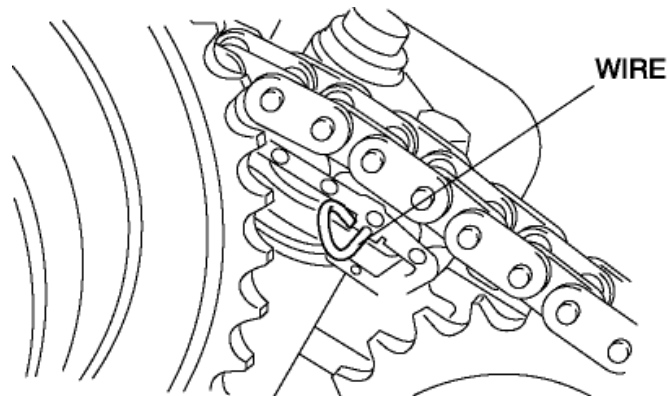
- Install the LH bank camshaft caps and temporarily tighten the camshaft cap bolts evenly in the order shown in several passes.



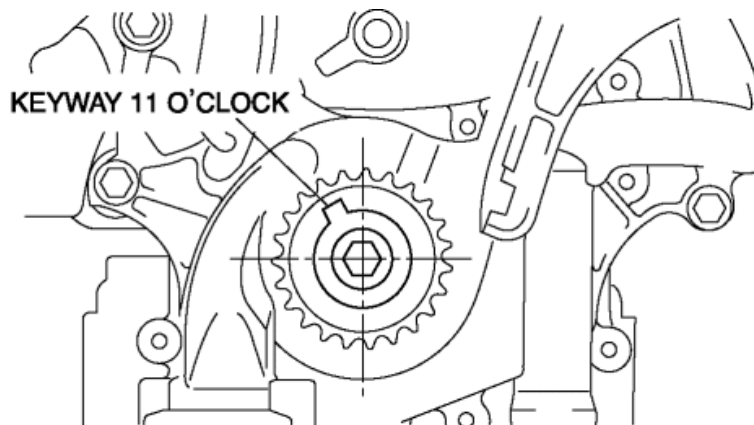
Tightening torque

- 9—11 N·m {92—112 kgf·cm, 80—97 in·lbf}

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



4. 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.)



Timing Chain Component Installation Note

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

2012 - Mazda6 - Engine

CYLINDER HEAD GASKET REPLACEMENT [MZI 3.7 V6]

WARNING:

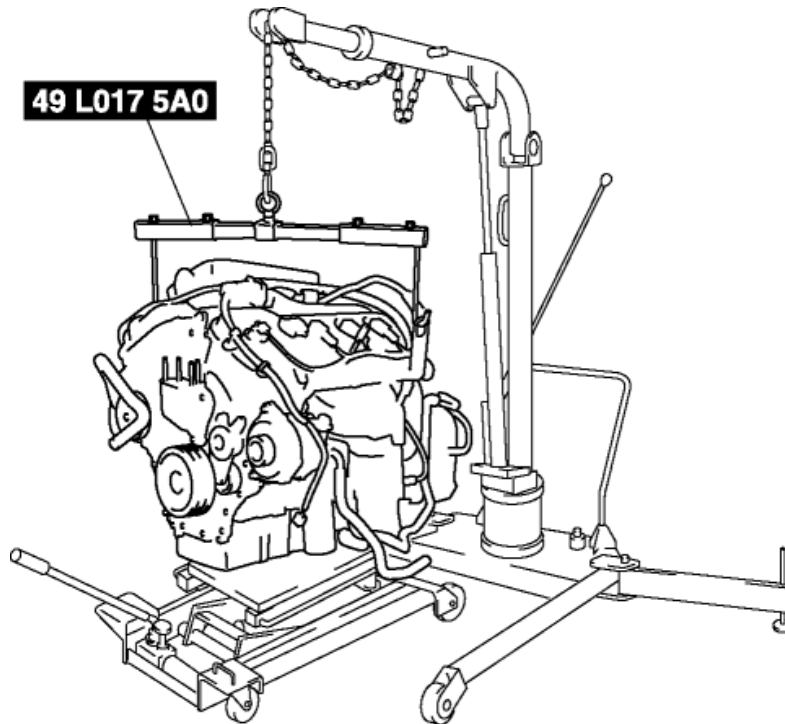
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- Continuous exposure to USED engine oil has caused skin cancer in laboratory mice. Protect your skin by washing with soap and water immediately after working with engine oil.

NOTE:

- The following procedure "CYLINDER HEAD GASKET REPLACEMENT" 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 fuel injector and fuel distributor together as a single unit. (See [FUEL INJECTOR REMOVAL/ INSTALLATION \[MZI 3.7 V6\]](#).)
6. Remove the thermostat and thermostat housing together as a single unit. (See [THERMOSTAT REMOVAL/ INSTALLATION \[MZI 3.7 V6\]](#).)

7. Remove the Intake manifold. (See **INTAKE-AIR SYSTEM REMOVAL/ INSTALLATION [MZI 3.7 V6] .**)
8. Remove both WU-TWCs together with both exhaust manifolds as a single unit. (See **EXHAUST SYSTEM REMOVAL/ INSTALLATION [MZI 3.7 V6] .**)
9. Remove the ignition coils. (See **IGNITION COIL REMOVAL/ INSTALLATION [MZI 3.7 V6] .**)
10. Remove the dipstick.
11. Remove the power steering oil pump drive belt. (See **DRIVE BELT REMOVAL/ INSTALLATION [MZI 3.7 V6] .**)
12. Remove the power steering oil pump. (See **POWER STEERING OIL PUMP REMOVAL/ INSTALLATION [MZI 3.7 V6] .**)
13. Remove the generator. (See **GENERATOR REMOVAL/ INSTALLATION [MZI 3.7 V6] .**)
14. Remove the OCV component (LH) (RH). (See **TIMING CHAIN REMOVAL/ INSTALLATION [MZI 3.7 V6] .**)
15. Remove in the order indicated in the table.
16. Install in the reverse order of removal.
17. 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.
18. Perform a road test.



1	Timing chain component (See Timing Chain Component Removal Note.) (See Timing Chain Component Installation Note.)
2	Camshaft cap (LH) (See Camshaft Component Removal Note.) (See Camshaft Component Installation Note.)
3	Camshaft timing chain tensioner (LH) (See Camshaft Component Removal Note.)

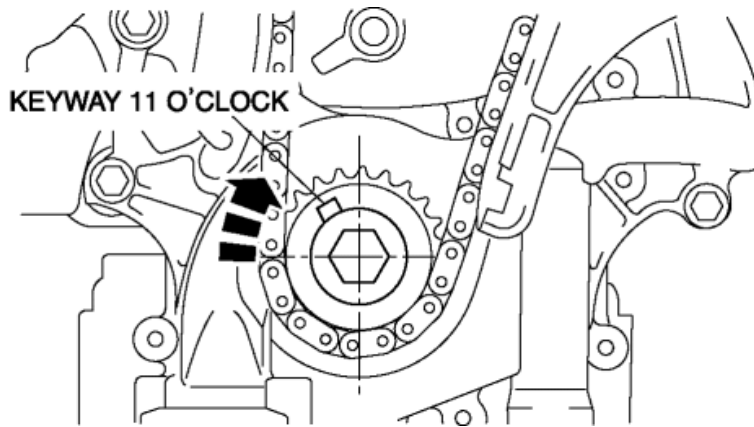
	(See Camshaft Component Installation Note.)
4	Camshaft timing chain (LH) (See Camshaft Component Removal Note.) (See Camshaft Component Installation Note.)
5	Camshaft component (LH) (See Camshaft Component Removal Note.) (See Camshaft Component Installation Note.)
6	Camshaft cap (RH) (See Camshaft Component Removal Note.) (See Camshaft Component Installation Note.)
7	Camshaft timing chain tensioner (RH) (See Camshaft Component Removal Note.) (See Camshaft Component Installation Note.)
8	Camshaft timing chain (RH) (See Camshaft Component Removal Note.) (See Camshaft Component Installation Note.)
9	Camshaft component (RH) (See Camshaft Component Removal Note.) (See Camshaft Component Installation Note.)
10	Cylinder head (LH) (See Cylinder Head Removal Note.) (See Cylinder Head Installation Note.)
11	Cylinder head gasket (LH)
12	Cylinder head (RH) (See Cylinder Head Removal Note.) (See Cylinder Head Installation Note.)
13	Cylinder head gasket (RH)

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.

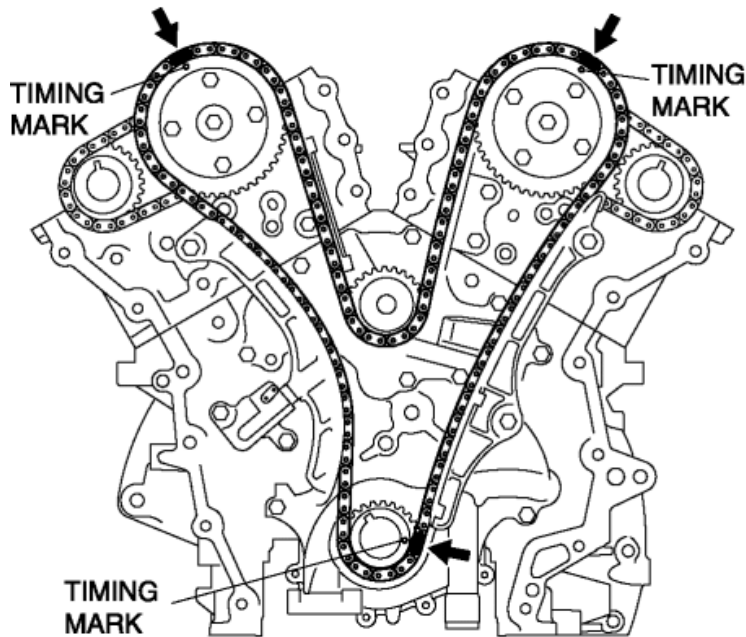
1. Turn the crankshaft clockwise so that the crankshaft keyway is in the 11 o'clock position. (This will position the No.1 cylinder at TDC.)



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.

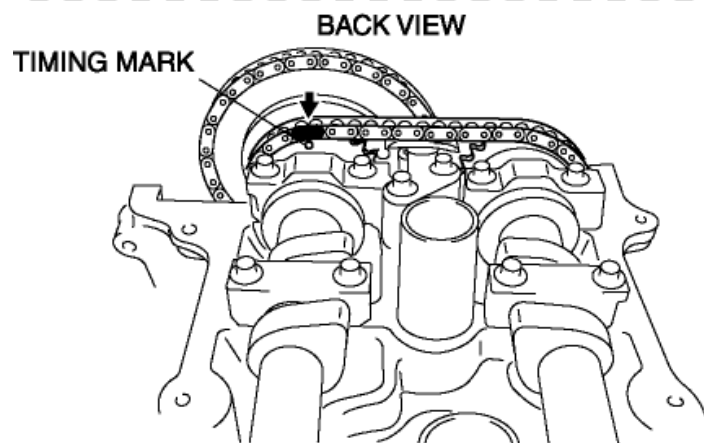
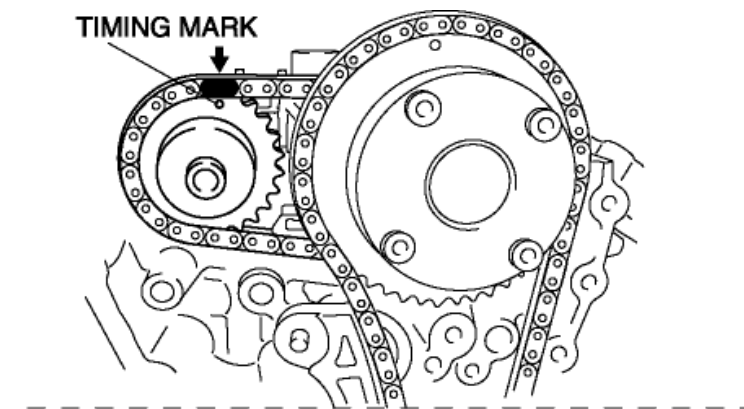
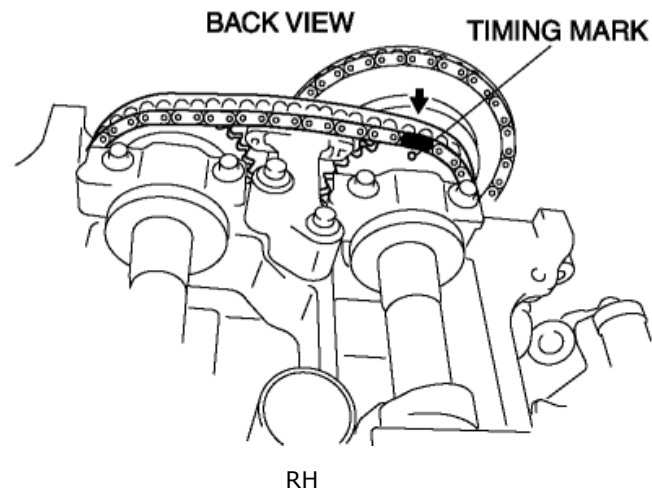
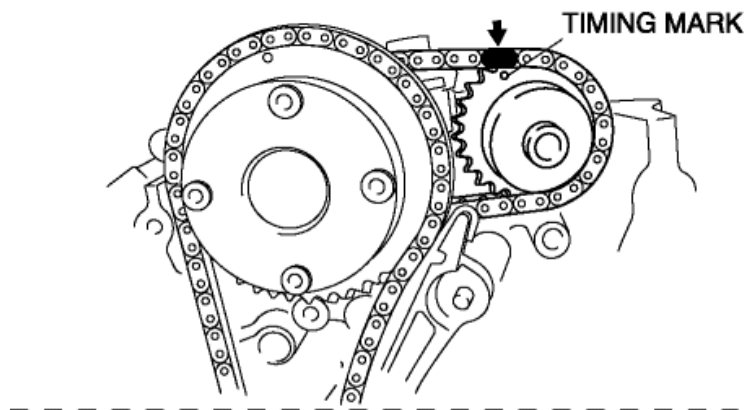
2. Mark the timing chain at the position of each timing sprocket timing mark.



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.

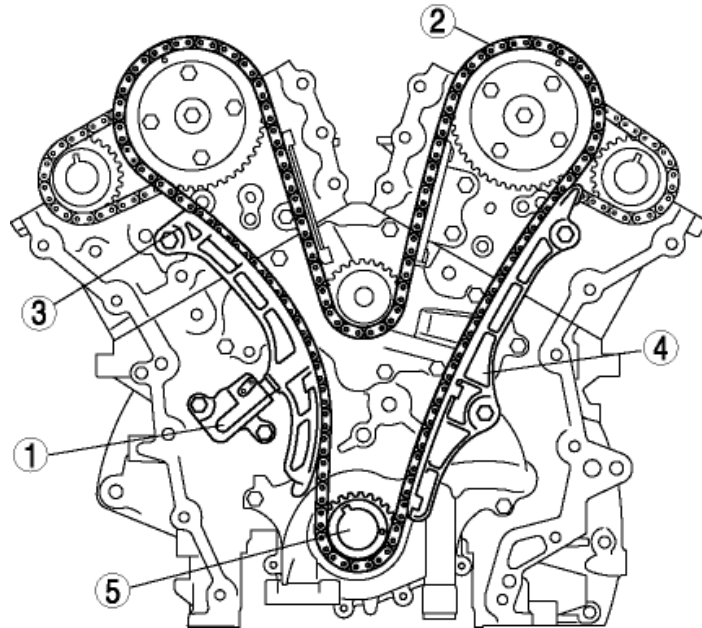
3. Mark the camshaft timing chain at the positions where it is aligned with each of the camshaft sprocket on both banks.



4. Remove the timing chain in the following order.

- a. Chain tensioner
- b. Timing chain

- c. Tensioner arm
- d. Chain guide
- e. Crankshaft sprocket

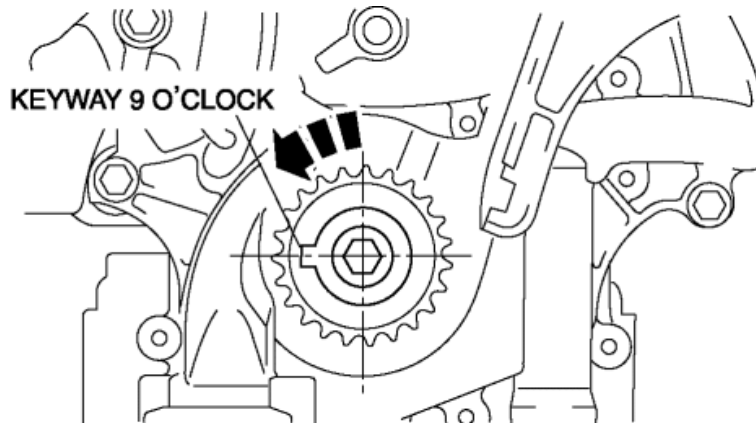


Camshaft Component Removal Note

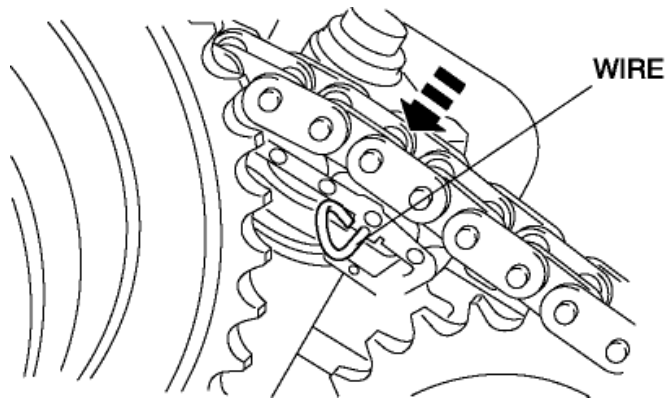
CAUTION:

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1. Rotate the crankshaft counterclockwise until the keyway is in the 9 o'clock position.

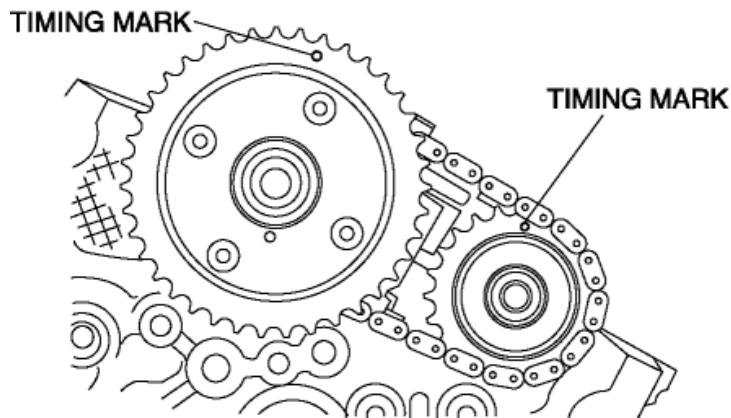


2. Slowly compress the camshaft timing chain tensioner (LH) piston by hand.
3. Insert an **approx. 1.0 mm { 0.039 in }** thin wire or paper clip into the camshaft timing chain tensioner (LH) shown in the figure to hold the tensioner piston.



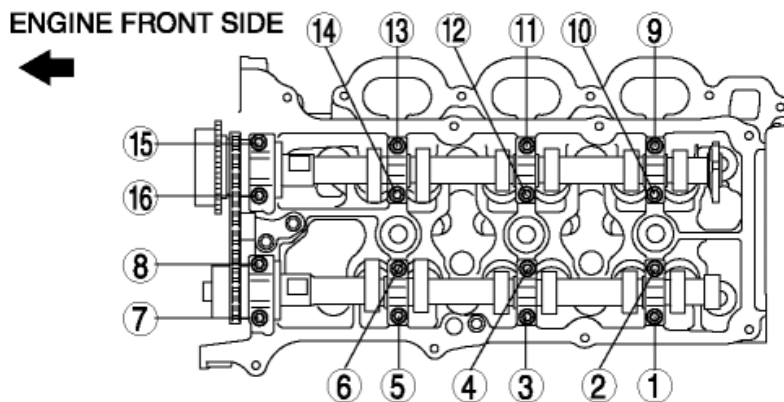
NOTE:

- When the timing chain removed, valve spring pressure will rotate the camshaft (LH) approx. 3 ° to a neutral position.
4. Verify that the camshafts (LH) are in the neutral position.

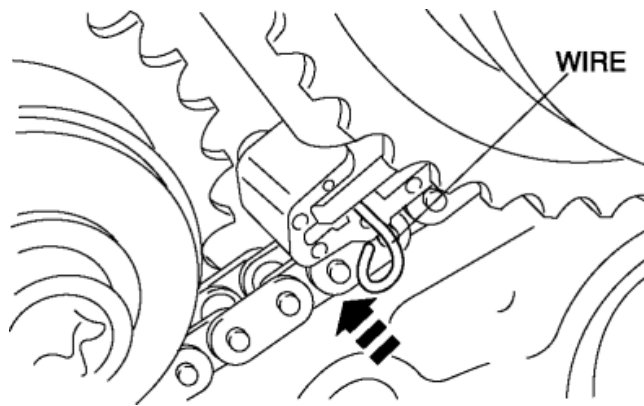


NOTE:

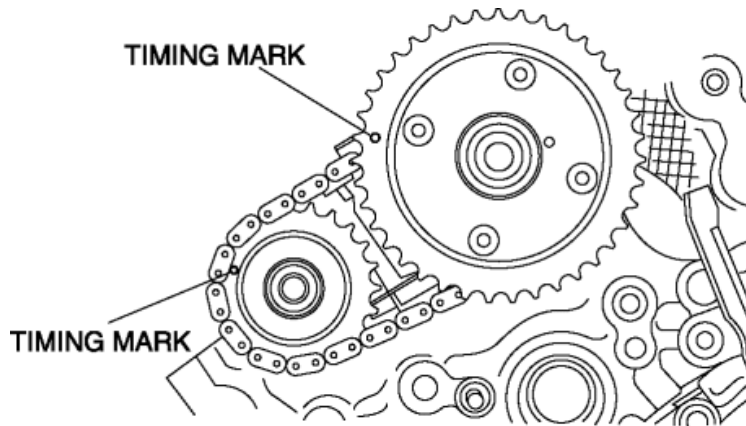
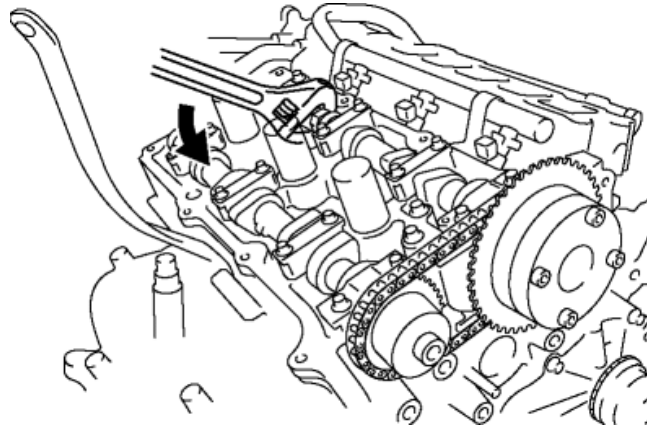
- The cylinder head and the camshaft bearing caps are numbered to make sure they are reassembled in their original position. When removed, keep the bearing caps with the cylinder head they were removed from. Do not mix the caps.
5. Loosen the LH bank camshaft cap bolts in several passes in the order shown in the figure and remove the camshaft cap.



6. Remove the camshaft, camshaft sprocket, camshaft timing chain, and camshaft timing chain tensioner of the LH bank as a single unit.
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. Put a wrench to the position shown in the figure on the RH bank camshaft, rotate the RH bank camshaft counterclockwise, and set the camshaft to the neutral position.

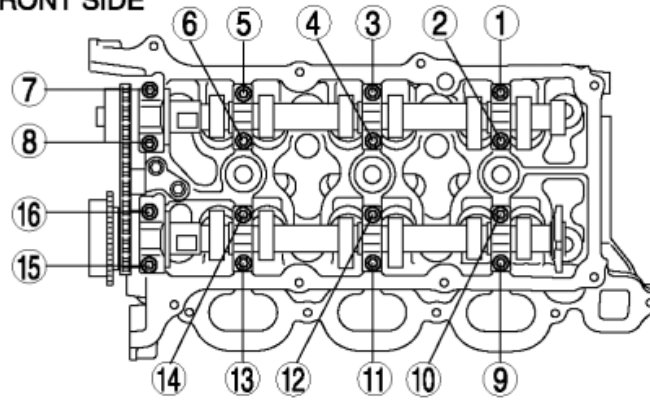


NOTE:

- The cylinder head and the camshaft bearing caps are numbered to make sure they are reassembled in their original position. When removed, keep the bearing caps with the cylinder head they were removed from. Do not mix the caps.

10. Loosen the RH bank camshaft cap bolts in several passes in the order shown in the figure and remove the camshaft cap.

ENGINE FRONT SIDE

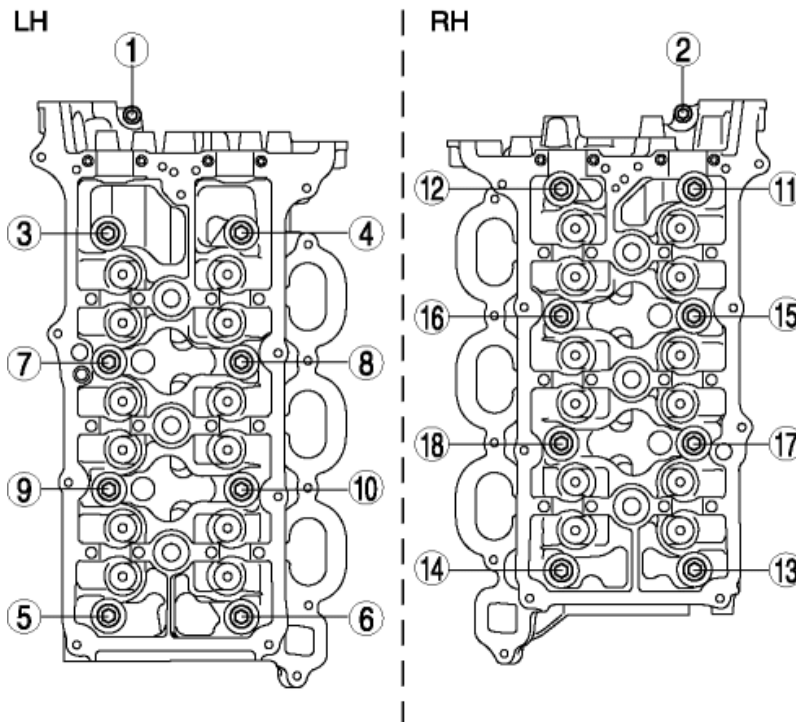


11. Remove the camshaft, camshaft sprocket, camshaft timing chain, and camshaft timing chain tensioner of the RH bank as a single unit.

Cylinder Head Removal Note

1. Loosen the cylinder head bolts in several passes in the order shown.

ENGINE FRONT SIDE

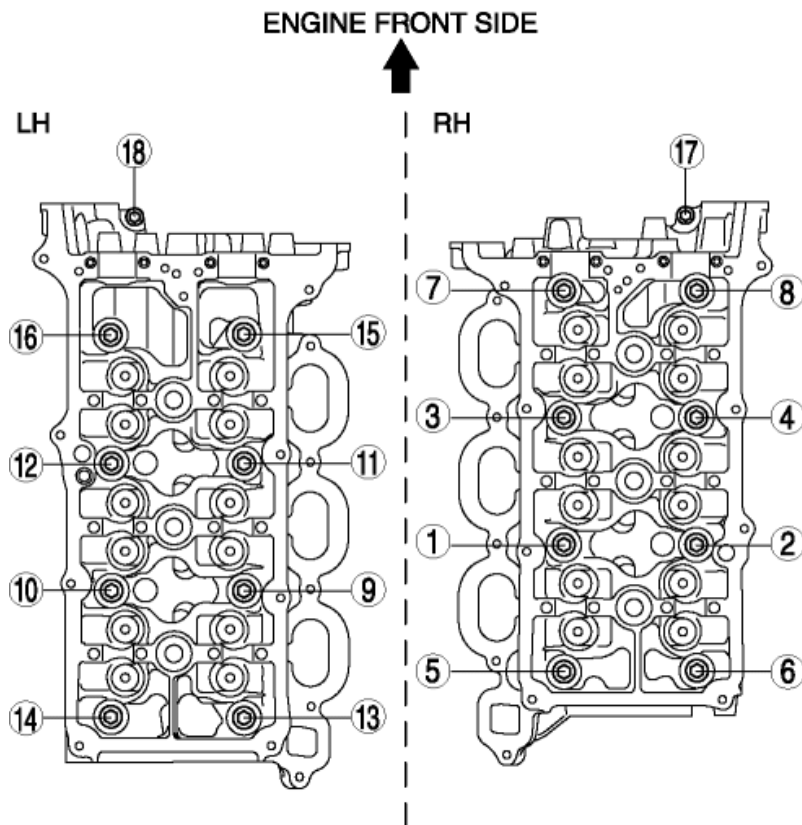


Cylinder Head Installation Note

NOTE:

- The cylinder head bolts must be replaced with new bolts. The bolts are torque-to-yield designed and cannot be reused.

1. Tighten the cylinder head bolts in the order in 6 steps in the order shown in the figure.



Tightening torque

Step	Installation position	Tightening torque
1	1—16	20 N·m {2.0 kgf·m, 15 ft·lbf}
2	1—16	35 N·m {3.6 kgf·m, 26 ft·lbf}
3	1—16	90 °
4	1—16	90 °
5	1—16	90 °
6	17, 18	9—11 N·m {92—112 kgf·cm, 80—97 in·lbf}

Camshaft Component Installation Note

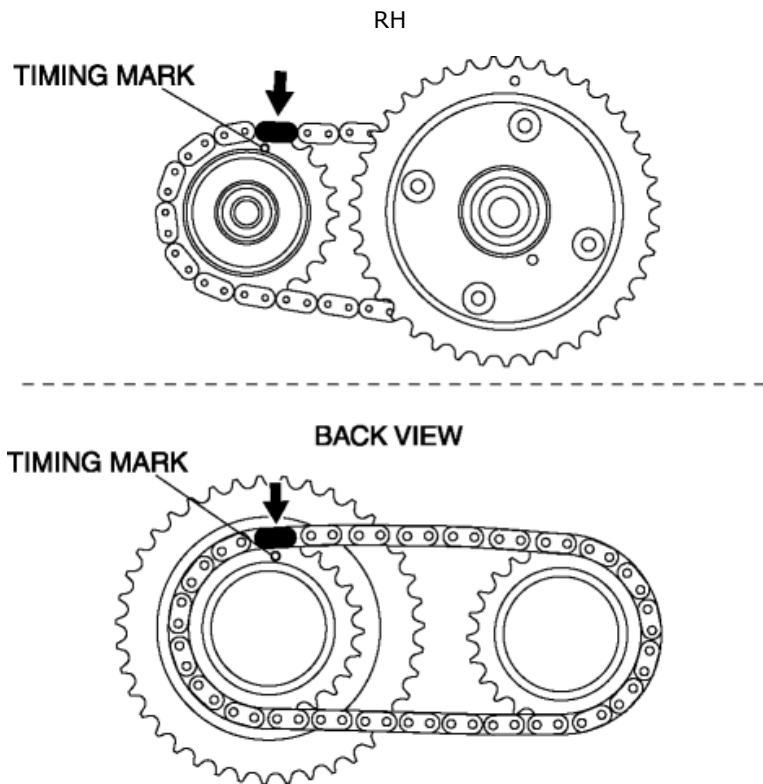
1. Assemble the camshaft timing chain tensioners on both sides.

Tightening torque

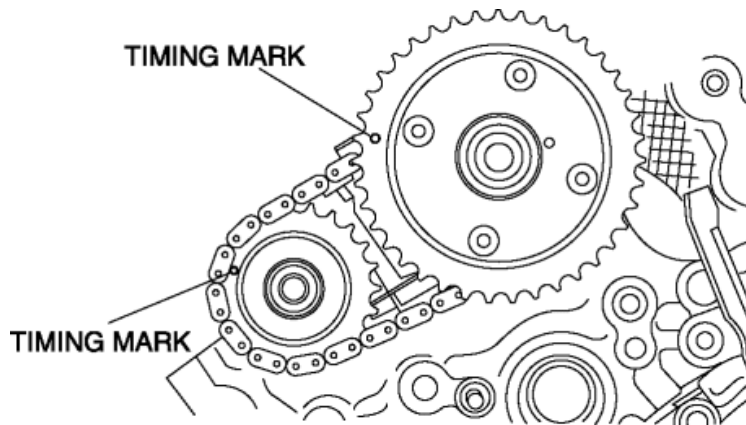
- 9—11 N·m {92—112 kgf·cm, 80—97 in·lbf}

NOTE:

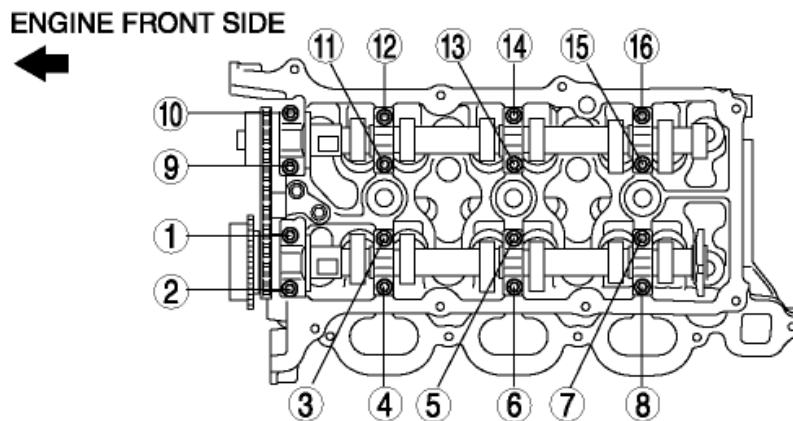
- Install the camshaft, camshaft sprocket and camshaft timing chain of the both bank as a single unit.
2. Install the camshaft component (RH).
 - a. Install the camshaft timing chain by aligning the colored links on the camshaft timing chain with the marks on the camshaft sprockets (RH).



b. Position the camshaft component onto the cylinder head (RH) in the neutral position as shown.



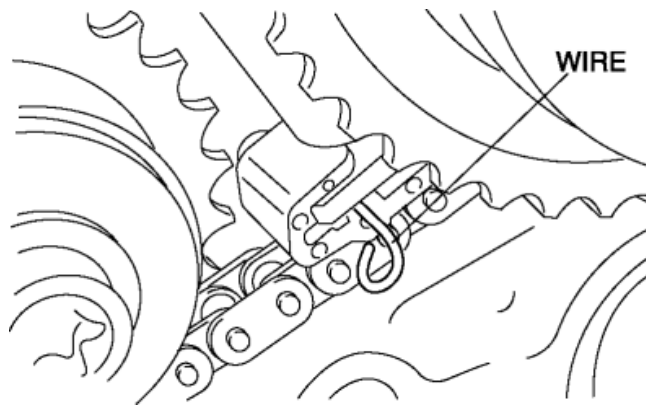
c. Install the RH bank camshaft caps and temporarily tighten the camshaft cap bolts evenly in the order shown in several passes.



Tightening torque

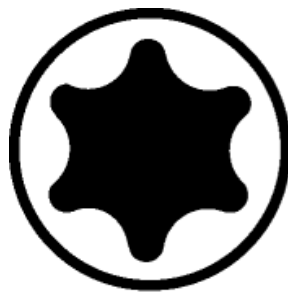
- 9—11 N·m {92—112 kgf·cm, 80—97 in·lbf}

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

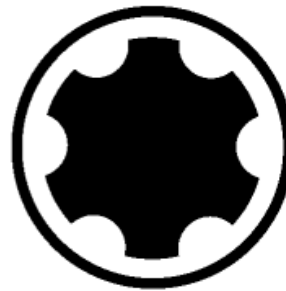


CAUTION:

- 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

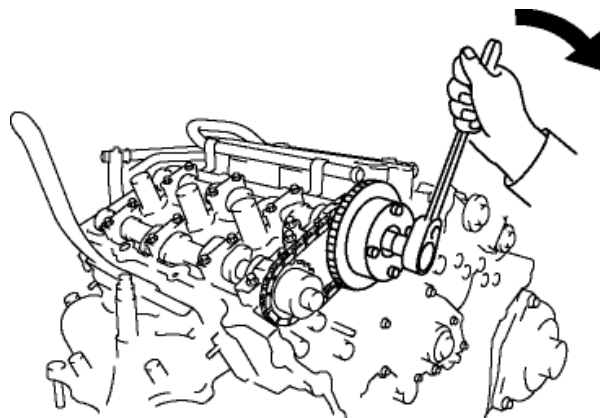


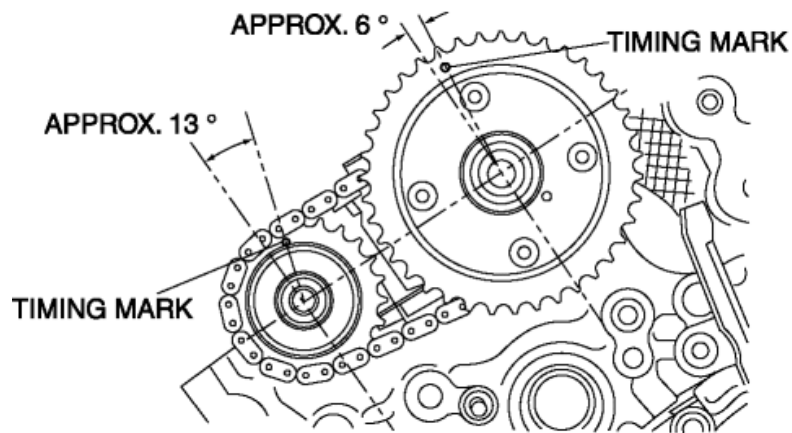
TORX PLUS

Tool size

- TORX: T55
- TORX PLUS: 55IP

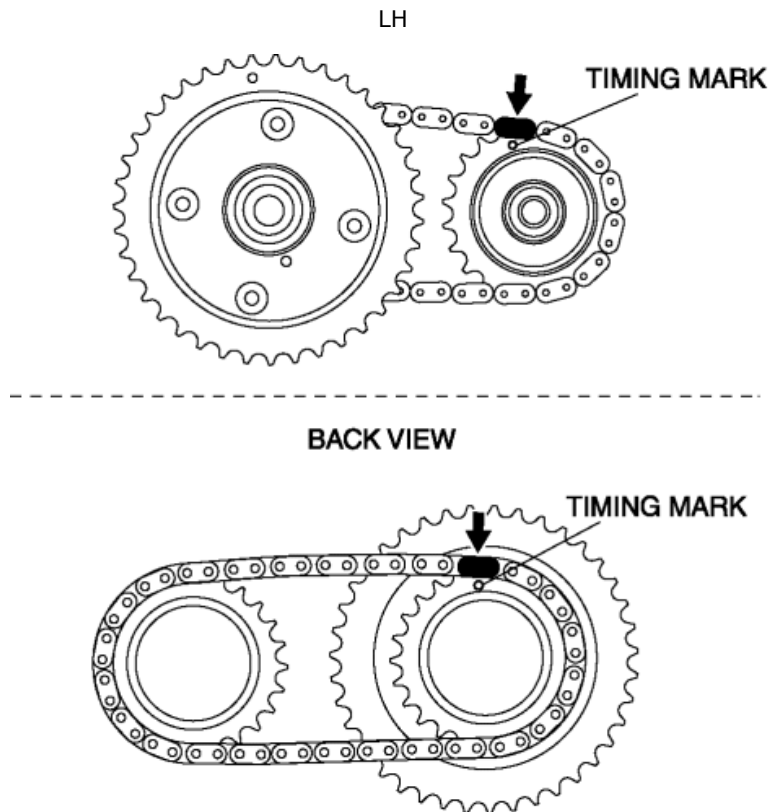
e. Using the RH bank camshaft sprocket bolt at the position shown in the figure, rotate the RH bank camshaft clockwise using the appropriate tools.



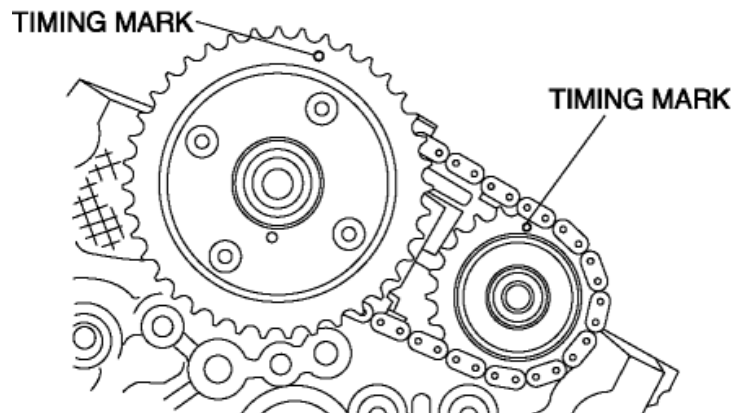


3. Install the camshaft component (LH).

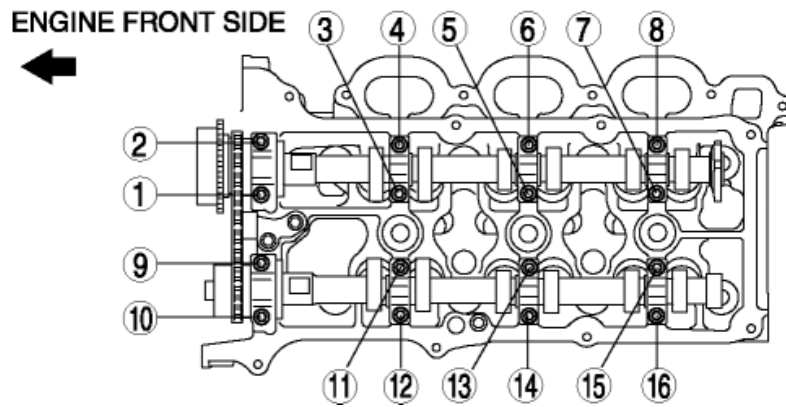
- Install the camshaft timing chain by aligning the colored links on the camshaft timing chain with the marks on the camshaft sprockets (LH).



- Position the camshafts onto the cylinder head (LH) in the neutral position as shown.



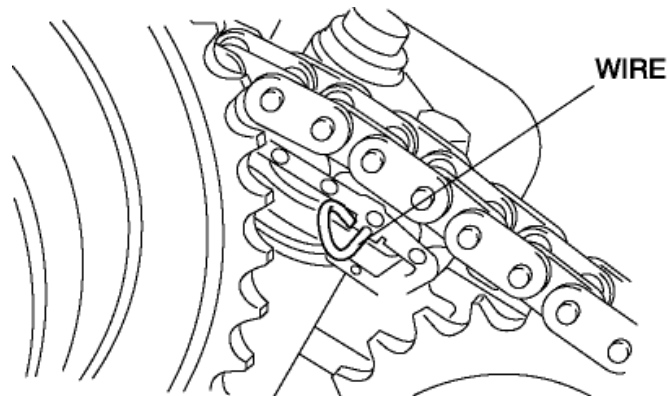
- Install the LH bank camshaft caps and temporarily tighten the camshaft cap bolts evenly in the order shown in several passes.



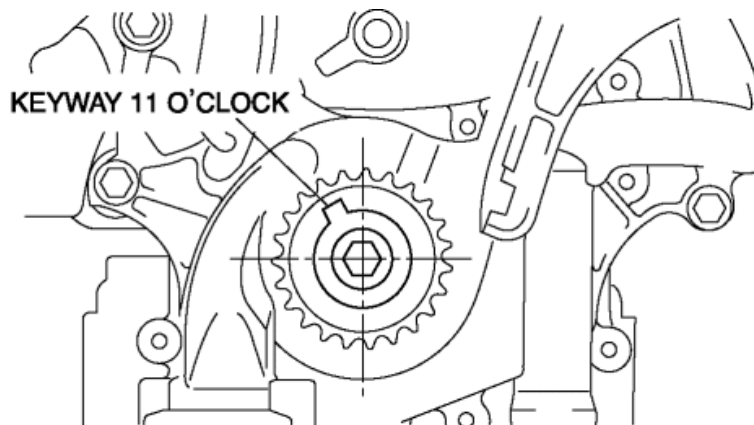
Tightening torque

- 9—11 N·m {92—112 kgf·cm, 80—97 in·lbf}

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



4. 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.)



Timing Chain Component Installation Note

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