

# Technical Service Bulletin

Mazda North American Operations  
Irvine, CA 92618-2922



<b>Subject:</b>  <b>ENGINE OIL LEVEL WARNING LIGHT ON WITH DTC P250F:00 DUE TO LOW ENGINE OIL LEVEL</b>	<b>Bulletin No.: 01-003/23</b>
	<b>Last Issued : 01/31/2023</b>

## BULLETIN NOTES

This bulletin supersedes the previously issued bulletin(s) listed below. The changes are noted below in Red.

Previous TSBs:	Date(s) Issued:
01-011/22	11/07/22 and 10/03/22
01-012/21	11/24/21 and 10/04/21

## APPLICABLE MODLE(S)/VINS

- 2021 Mazda3 (Japan built 2.5T) with VINS from JM1BP\*\*\*\*\*315204 - 403637 (produced from October 12, 2020 to September 13, 2021)
- 2021-2022 Mazda3 (Mexico built 2.5T) with VINS starting from 3MZBP\*\*\*\*\*209389 - 307372 (produced from December 8, 2020 to June 16, 2022)
- 2021-2022 CX-30 (2.5T) with VINS starting from 3MVDM\*\*\*\*\*233598 - 437812 (produced from December 7, 2020 to June 30, 2022)
- 2021 Mazda6 (2.5T) with VINS from JM1GL\*\*\*\*\*602506 - 618909 (produced from October 6, 2020 to September 14, 2021)
- 2021 CX-5 (US/Canada spec 2.5T with 10.25" center display) with VINS from JM3KF\*\*\*\*\*320280 - 472324 (produced from October 6, 2020 to September 13, 2021)
- 2021 CX-9 (US/Canada spec 2.5T with 10.25" center display) with VINS from JM3TC\*\*\*\*\*509027 - 541070 (produced from October 6, 2020 to September 13, 2021)
- 2021 CX-5 (Canada/Mexico spec 2.5T with 8" center display) with VINS from JM3KF\*\*\*\*\*112005 - 135036 (produced from October 6, 2020 to September 1, 2021)
- 2021 CX-9 (Canada/Mexico spec 2.5T with 7" or 9" center display) with VINS from JM3TC\*\*\*\*\*451418 - 455173 (produced from October 6, 2020 to September 11, 2021)

## DESCRIPTION

Some vehicles may have a "LOW ENGINE OIL LEVEL" warning message and an **engine oil level warning light** on in the instrument cluster with DTC P250F:00 stored in memory, and the oil level has actually decreased to near low.

- DTC P250F:00 - Engine oil level signal: engine oil level low

This is caused by an oil consumption increase due to damage of the valve seals on the exhaust side. To eliminate this concern, the design of these valve seals has been modified.

Customers having this concern should have their vehicle repaired using the following repair procedure.

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**REPAIR PROCEDURE****Procedure Support Videos:**

- A. SST Overview
- B. Main Body Assembly
- C. Additional Required Tools
- 01 Prep and Main Body Install
- 02 Valve Spring Retainer, Keeper Removal
- 03 Valve Stem Seal Remove and Replace
- 04 Valve Spring, Retainer and Keeper Installation
- 05 Rocker Arm Reinstallation
- 06 Rocker Arm 6 Remove and Reinstall
- 07 Rocker Arm 3 Remove and Reinstall

1. Verify the customer concern.

- Confirm with the oil level gauge that the engine oil has actually decreased. If the engine oil has NOT decreased, this TSB is not applicable.
- Confirm the engine oil is not leaking from the engine. If the engine oil leaked from the engine, this TSB is not applicable.

2. Replace the valve seals of the exhaust side with improved ones using the special tools called out in the repair procedures below.

3. Verify the repair.

**Contents****(A) Required Parts and Tools****(B) SST****(C) Related Parts Removal (before replacing the valve seal)**

- *Related Parts Removal*
- *Blocking the oil drain holes with a suitable material to prevent parts from falling into the engine*

**(D) Valve Seal Replacement of the Exhaust Side**1. *SST Main Body Installation*

Perform the work in the following order.

(1) #1 Cylinder (Front)	(3) #3 Cylinder (Front)	(5) #4 Cylinder (Front)	(7) #2 Cylinder (Front)
(2) #1 Cylinder (Rear)	(4) #3 Cylinder (Rear)	(6) #4 Cylinder (Rear)	(8) #2 Cylinder (Rear)

- 2. *Rocker arm removal*
- 3. *Valve spring removal*
- 4. *Valve seal removal*
- 5. *Valve seal installation*
- 6. *Valve spring installation*
- 7. *Rocker arm installation*

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**(E) Related Parts Reassembly****PRECAUTIONS**

- Using a topside creeper will reduce fatigue and make performing the procedure easier.
- Use fender covers to prevent damage to the vehicle paint and body.

**(A) Required Parts and Tools**

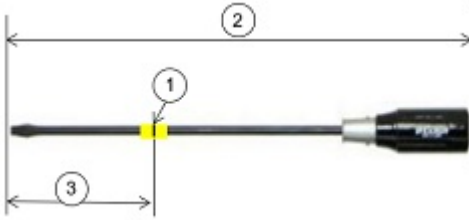
#	Part name	Part Number	Qty.	Remarks
1	Valve seal	PY8W-10-1F5	8	Exhaust Valve
2	Cylinder head cover gasket	PY8W-10-235	1	Cylinder head cover

## Other items to be prepared (other than general tools)

#	Tool	Qty.	Remarks
1	Liquid gasket	as needed	TB1217D
2	Grease	as needed	Apply to SST's screws or attachments.
3	Long screwdriver (*)	1	For confirming the compression top dead center.
4	Slim magnet pickup tool	1	For removing a keeper, upper sheet, rocker arm, etc.
5	Torque wrench (for adjusting a small amount of torque)	1	0.74 - 1.48 lbf·ft (1 - 2 N·m, 0.1 - 0.2 kgf·m)
6	Torque wrench (general)	1	1.48 - 19.18 lbf·ft (2 - 26 N·m, 0.2 - 2.7 kgf·m)
7	Wire (For plugging the oil drain back hole)	5	Diameter: approx. 0.02" (0.5 mm) Length: approx. 6" (150mm)
8	Thin Fabric (For plugging the oil drain back hole)	5	Size: 6" x 6" (150mm x 150 mm)

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(\*) Long screwdriver for confirming the piston's position  
 Mark as shown in the figure below.



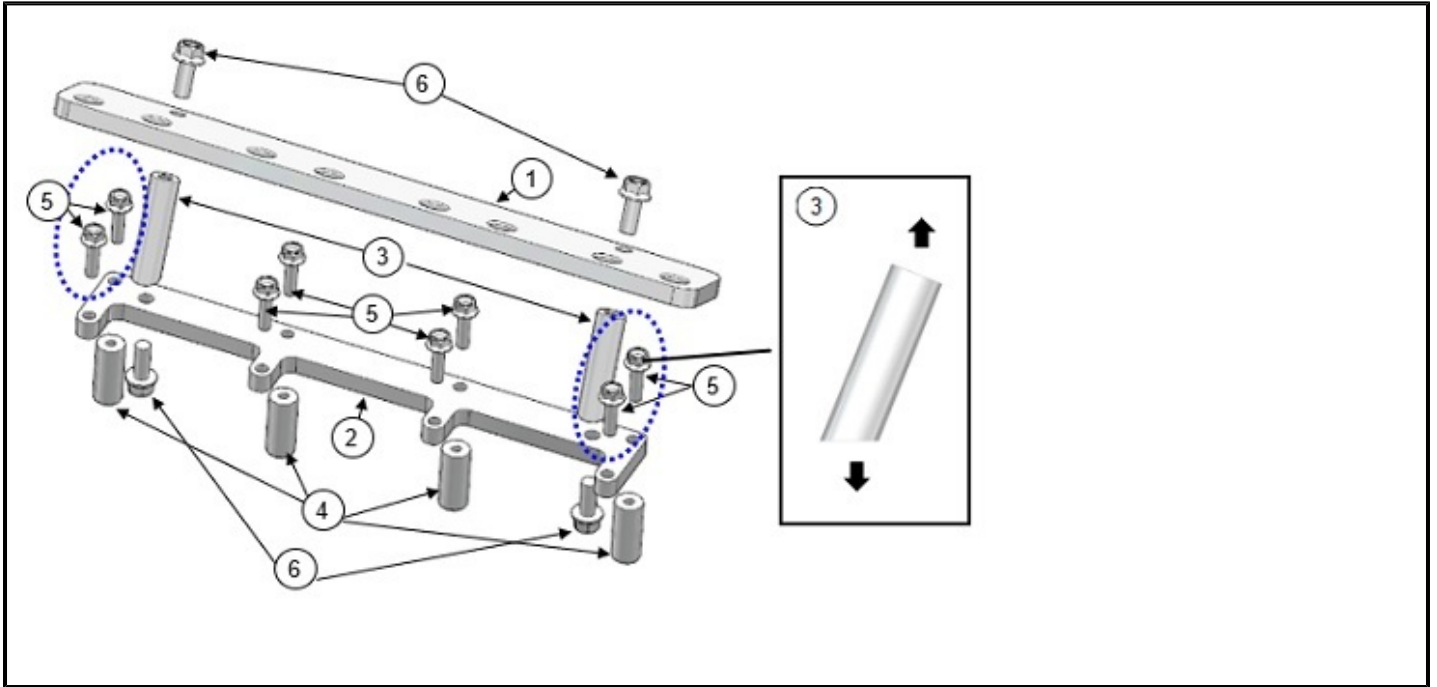
1	Compression top dead center position
2	Approx. 17.7" (450mm)
3	5.6" (143mm)

**(B) SST**

[The breakdown of the SST]

MAIN BODY ASSEMBLY - (Assembly Tool Part Number 49JP111A0)		
No	Qty.	Name
#1	1	Bracket - No.1
#2	1	Bracket - No.2
#3	2	Bracket - No.3
#4	4	Bracket - No.4
#5	8	Bolt - M6
#6	4	Bolt - M8

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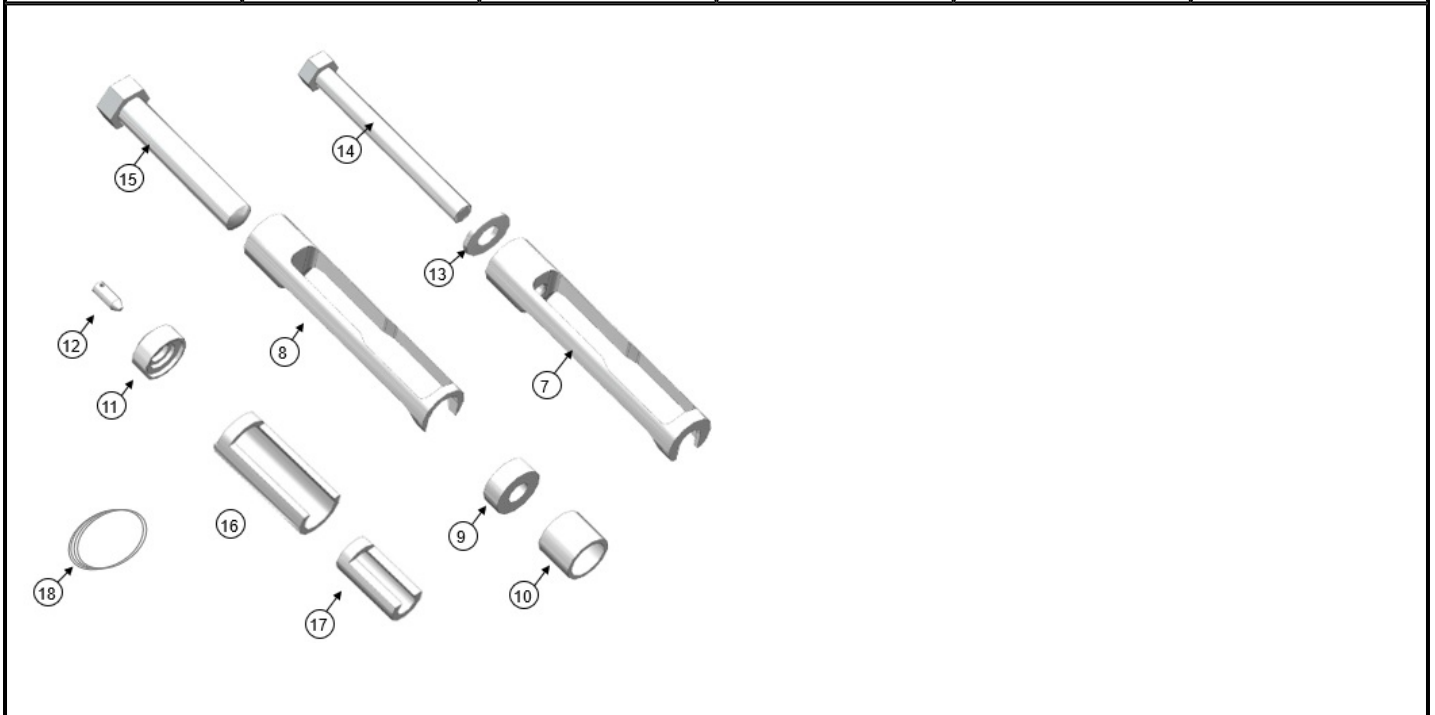


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OTHER PARTS

**NOTE:** DO NOT use the SST packing list for tool names.

No	Qty.	Name	No	Qty.	Name
#7	1	Valve seal removal tool	#13	1	Washer - M10
#8	1	Valve spring compression tool	#14	1	Bolt - 8mm
#9	1	Valve seal installation tool B	#15	1	Bolt - 12mm
#10	1	Valve seal installation tool A	#16	1	Valve seal height checker - Outer cylinder
#11	1	Valve keeper installation tool	#17	1	Valve seal height checker - Inner cylinder
#12	1	Valve keeper guide	#18	1	Wire - attach to keeper installation guide



**NOTE:** SST # is described in the box of the SST kit.

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**SST Main Body**

1. Attach the diagonally cut side of brackets #3 to the lower bracket #2 using the M8 bolts as shown in the X-X view.
2. Attach the upper bracket #1 to the columns #3 using the (#6) M8 bolts.
3. Attach the 4 round brackets #4 to the lower bracket #2 using the M6 bolts

**NOTE:** The remaining M6 bolts will be used to attach the tool to the engine.

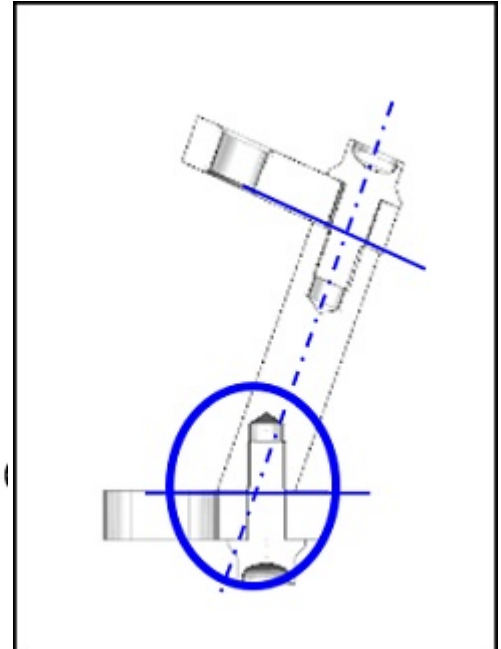
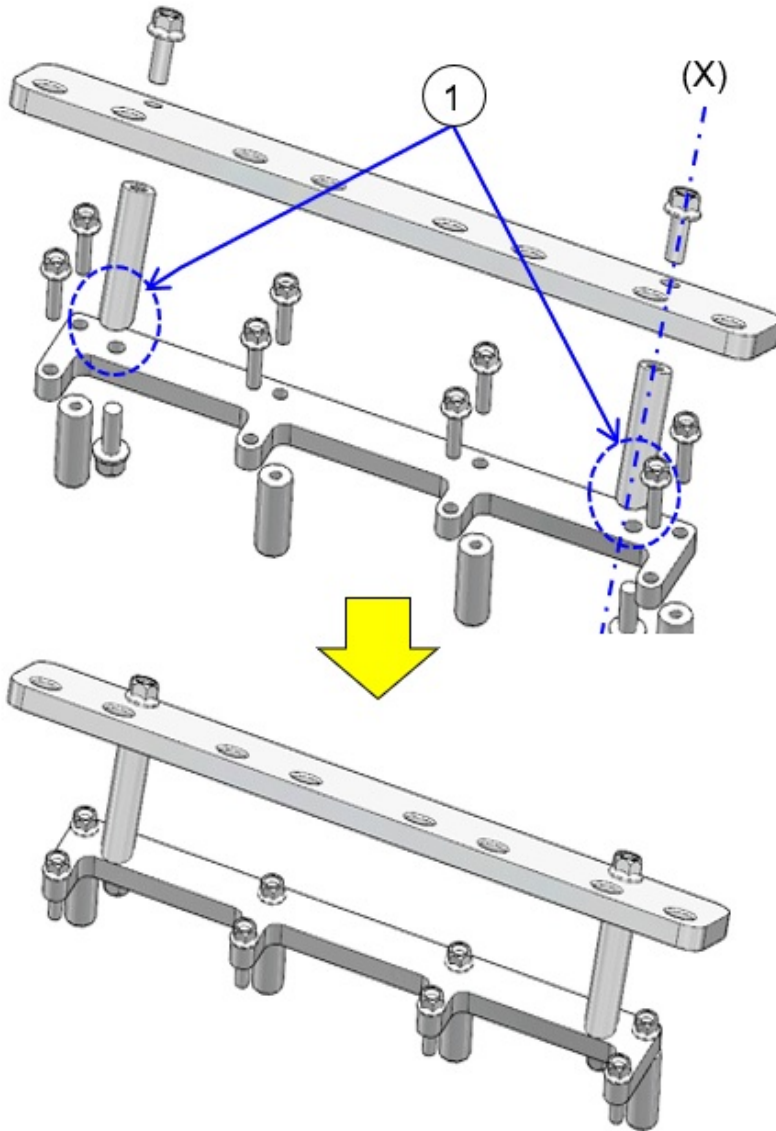
**[Tightening torque]**

**(#5) M6 (8 pcs.): 3.1 - 3.84 lbf·ft (4.2 - 5.2 N·m, 0.43 - 0.53 kgf·m)**

**(#6) M8 (4 pcs.): 5.9 - 7.38 lbf·ft (8 - 10 N·m, 0.82 - 1.02 kgf·m)**

[X-X section]

The diagonally cut side of the column is downwards. (Circled area)

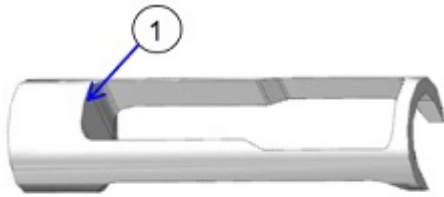


(1) The diagonally cut side of the column is downwards.

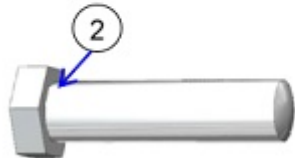
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**Valve Spring Compression Tool**

(#8) and (#15) of the SST kit



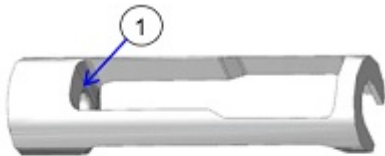
(1) There is no threaded hole because the tool is pushed down to compress the spring.



(2) Bolt: 12mm thread, 17mm head

**Valve Seal Removal Tool**

(#7), (#13) and (#14) of the SST kit



(1) There is a threaded hole to lift the tool by turning the bolt.



(2) Bolt: 8mm thread (12mm head)

**Valve Seal Installation Tools**

(#9) and (#10) of the SST kit



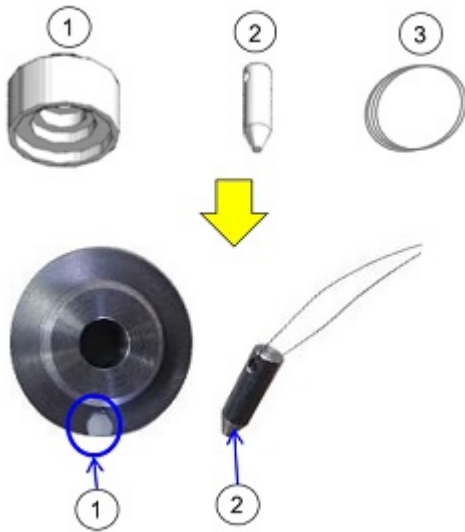
(1) Valve seal installation tool B (#9)  
 (2) Valve seal installation tool A (#10)

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### Valve Keeper Installation Tools

(#11), (#12) and (#18) of the SST kit



(1) Valve keeper installation tool (#11, #12, #18) A: Mark a point on the attachment (1) to identify the slit of the keeper mating surface.

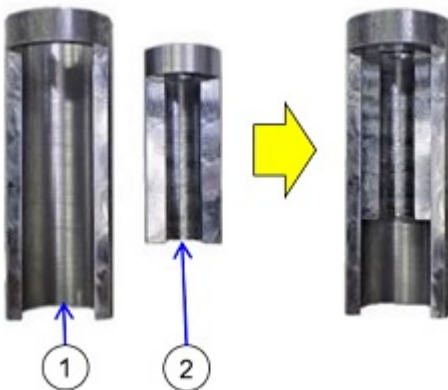
(2) Valve keeper installation tool (#11, #12, #18) B: Insert a wire (3) into the hole of the keeper guide (2).

(3) Wire

### Valve Seal Height Checker

(#16) and (#17) of the SST kit

1. Slide the inner cylinder (2) into the outer cylinder (1) to measure the seal height after installing the new seals.



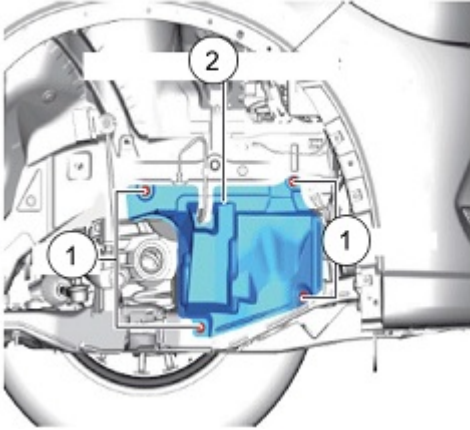
(1) Outer Cylinder  
(2) Inner Cylinder

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**(C) Related Parts Removal (before replacing the valve seal)****Related Parts Removal**

1. Remove the right front splash shield so that the crankshaft can be rotated.

**NOTE:** Turn the steering wheel to the right for easier access to the crankshaft bolt.

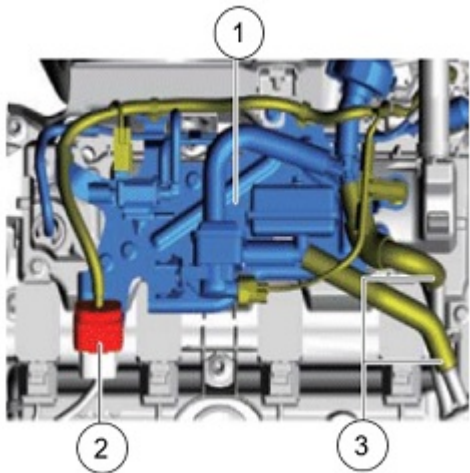


- (1) Fastener
- (2) Front splash shield

2. Disconnect the negative battery (-) terminal according to the instructions on MGSS (NEGATIVE BATTERY TERMINAL DISCONNECTION / CONNECTION).

3. Remove the plug hole plate in according to the instructions on MGSS (PLUG HOLE PLATE REMOVAL/ INSTALLATION).

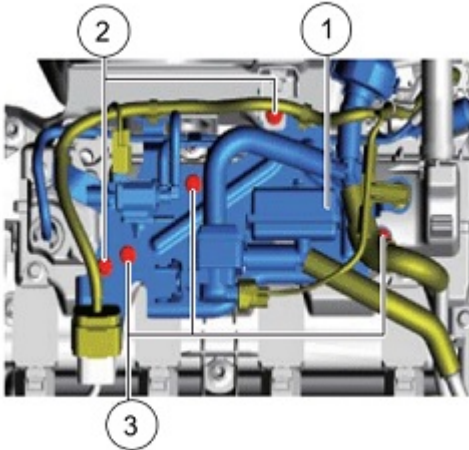
4. On the top engine, disconnect the harness and connector shown in the figure.



- (1) Purge solenoid valve assembly
- (2) Connector
- (3) Hose (vacuum pipe side)

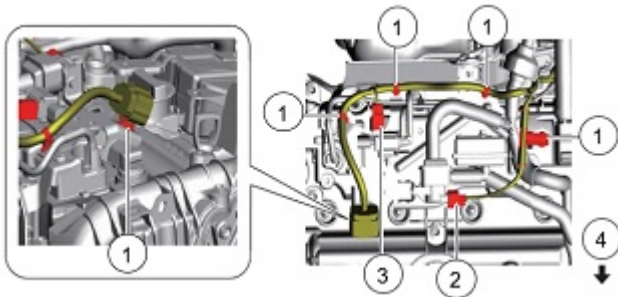
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5. Remove the four bolts shown in red.



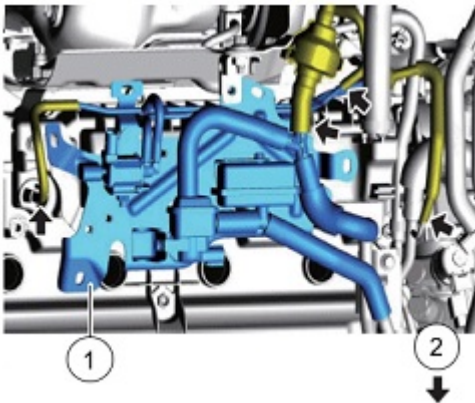
- (1) Purge solenoid valve assembly
- (2) Bolt: 5.9 - 7.38 lbf·ft (8 - 10 N·m, 0.82 - 1.02 kgf·m)
- (3) Bolt: 5.9 - 8.11 lbf·ft (8 - 11 N·m, 0.82 - 1.12 kgf·m)

6. Disconnect the two connectors and five clips shown in red and move the harness aside.



- (1) Harness clip
- (2) Purge solenoid valve connector
- (3) Solenoid valve connector
- (4) Vehicle Front

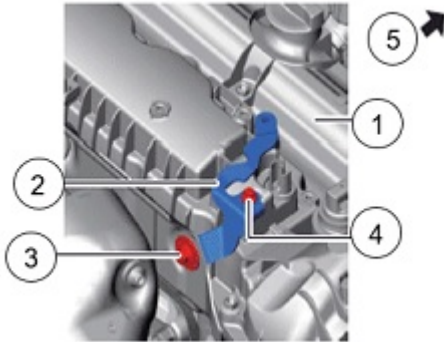
7. Remove the hose as shown, then remove the purge solenoid bracket assembly.



- (1) Purge solenoid bracket assembly
- (2) Vehicle front

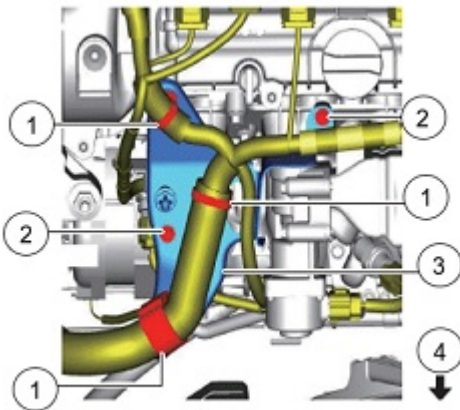
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8. Remove the bolts shown in red, then remove the bracket.



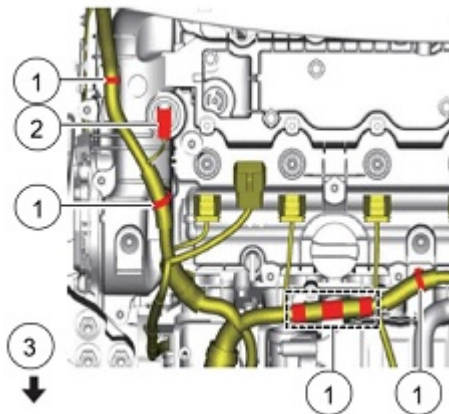
- (1) Cylinder head cover
- (2) Bracket
- (3) Bolt: 6.64 - 8.85 lbf·ft (9 - 12 N·m, 0.92 - 1.22 kgf·m)
- (4) Bolt: 5.9 - 8.11 lbf·ft (8 - 11 N·m, 0.82 - 1.12 kgf·m)
- (5) Vehicle front

9. Remove the bolts and clips as shown in red, then remove the harness bracket.



- (1) Harness clip
- (2) Bolt: 5.9 - 8.11 lbf·ft (8 - 11 N·m, 0.82 - 1.12 kgf·m)
- (3) Harness bracket
- (4) Vehicle front

10. Move the engine harness aside for the following steps.  
a. Disconnect or remove the parts shown in red.

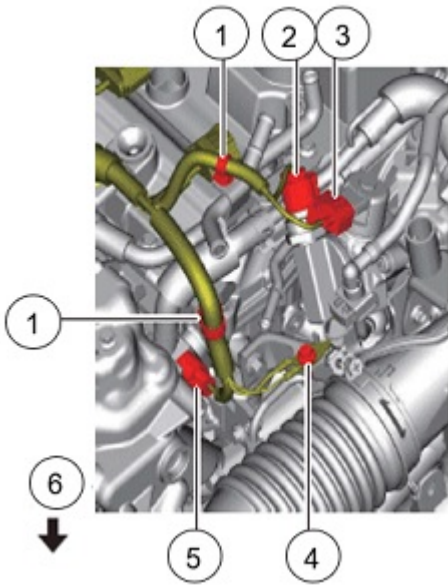


- (1) Harness clip
- (2) OCV connector
- (3) Vehicle front

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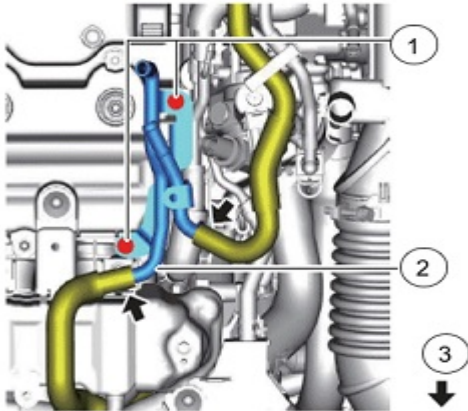


b. Place the engine harness aside where it will not interfere with the work.



- (1) Harness clip
- (2) Fuel pressure sensor connector
- (3) High-pressure fuel pump connector
- (4) Bolt: 5.9 - 8.11 lbf·ft (8 - 11 N·m, 0.82 - 1.12 kgf·m)
- (5) Camshaft position sensor connector
- (6) Vehicle front

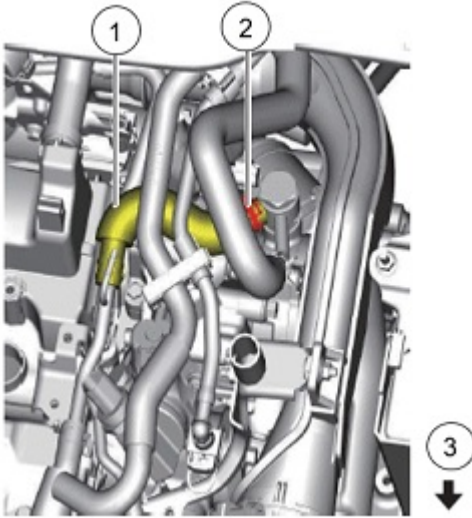
11. Remove the hoses shown and remove the bolts shown in red, then remove the vacuum pipe assembly.



- (1) Bolt: 5.9 - 8.11 lbf·ft (8 - 11 N·m, 0.82 - 1.12 kgf·m)
- (2) Vacuum pipe assembly
- (3) Vehicle front

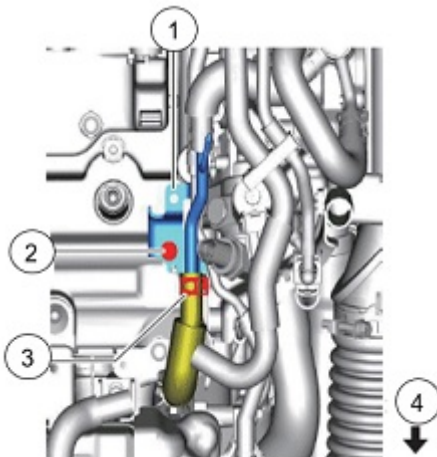
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12. Remove the vacuum hose (1) and remove the clip (2).



- (1) Vacuum hose
- (2) Clip
- (3) Vehicle front

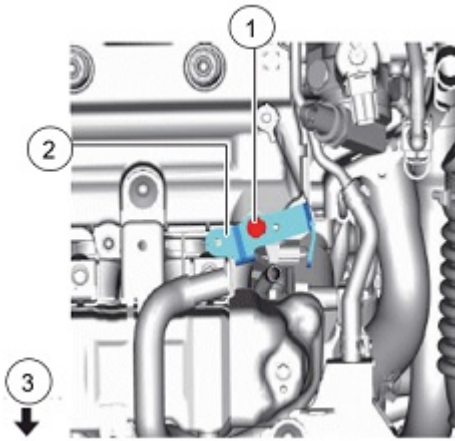
13. Remove the bolt (2), then disconnect the clip (3) and hose and set aside (avoid interfering with connected water hose).



- (1) Air pipe assembly
- (2) Bolt: 5.9 - 8.11 lbf·ft (8 - 11 N·m, 0.82 - 1.12 kgf·m)
- (3) Clip
- (4) Vehicle front

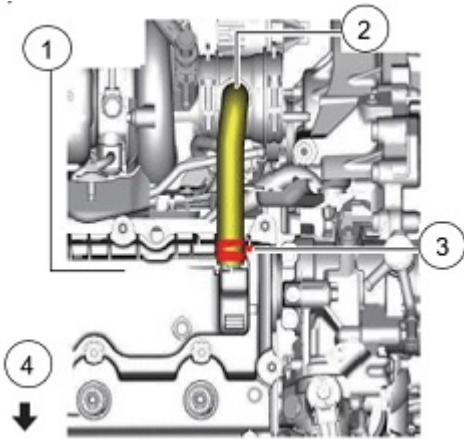
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14. Remove the bolt and the harness bracket.



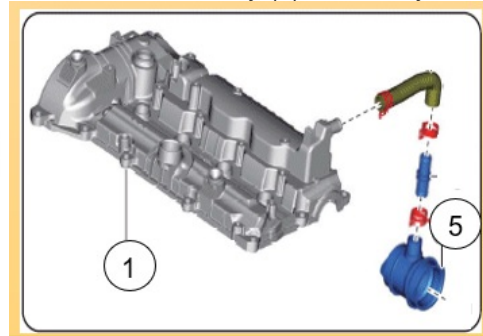
- (1) Bolt: 5.9 - 8.11 lbf·ft (8 - 11 N·m, 0.82 - 1.12 kgf·m)
- (2) Harness bracket
- (3) Vehicle front

15. Remove the breather hose.



**[For the US specification]**

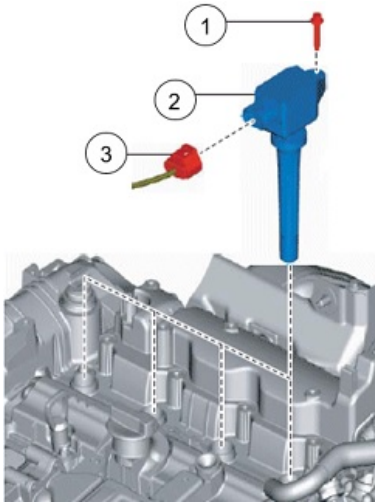
Remove the breather hose with the turbocharger air inlet hose (5) and the head cover assembly (1) since they are clamped together.



- (1) Cylinder head cover
- (2) Breather hose
- (3) Clip
- (4) Vehicle front
- (5) Air inlet hose

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16. Remove the ignition coil/ion sensor with bolts and connectors.

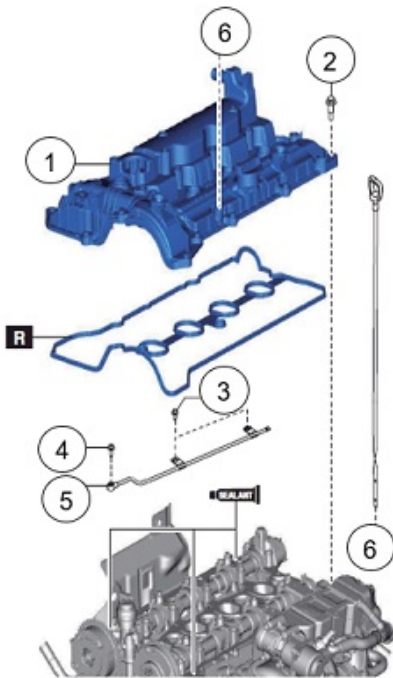


- (1) Bolt: 5.9 - 8.11 lbf·ft (8 - 11 N·m, 0.82 - 1.12 kgf·m)
- (2) Ignition coil/ion sensor
- (3) Connector

17. Remove the spark plugs.

18. Remove the cylinder head cover and oil shower pipe on the exhaust side.

**NOTE:** The cylinder head cover gasket is non-reusable.



- (1) Cylinder head cover
- (2) Bolt: 3.32 - 5.16 lbf·ft (4.5 - 7.0 N·m, 0.46 - 0.71 kgf·m)
- (3) Bolt: 0.92 - 6.64 lbf·ft (8 - 9 N·m, 0.82 - 1.22 kgf·m)
- (4) Bolt: 6.64 - 8.85 lbf·ft (9 - 12 N·m, 0.92 - 1.22 kgf·m)
- (5) Oil shower pipe
- (6) Oil level gauge

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**Blockage of the oil drain holes with a suitable material to prevent parts from falling into the engine**

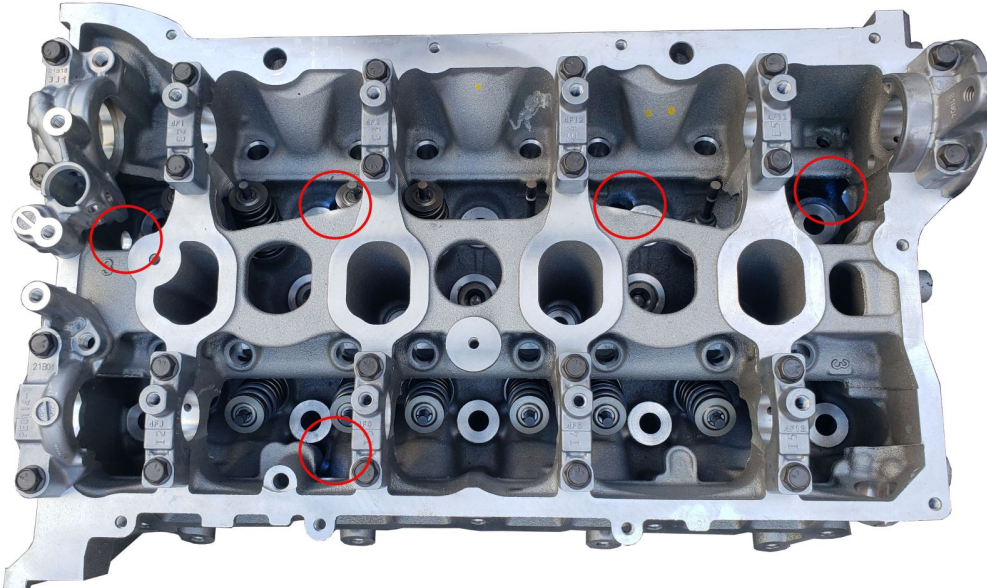
**CAUTION: Failure to install the oil drain back plugs and protective tape could allow an accidentally dropped keeper or foreign object to enter the engine. Any object dropped into the engine must be retrieved before the engine is rotated. Labor/parts required to retrieve dropped objects or damage to the engine are not covered under warranty.**

1. Cover the oil holes in the cylinder head with a thin 6" x 6" (150mm x 150mm) rag wrapped around about 0.2" (0.5 mm) diameter wire or any other suitable material.



(1) Insert a wire for easy bending and inserting easily.

**NOTE:** There are three holes on the exhaust side, one hole on the intake side, and one near the timing chain (hole is sideways).

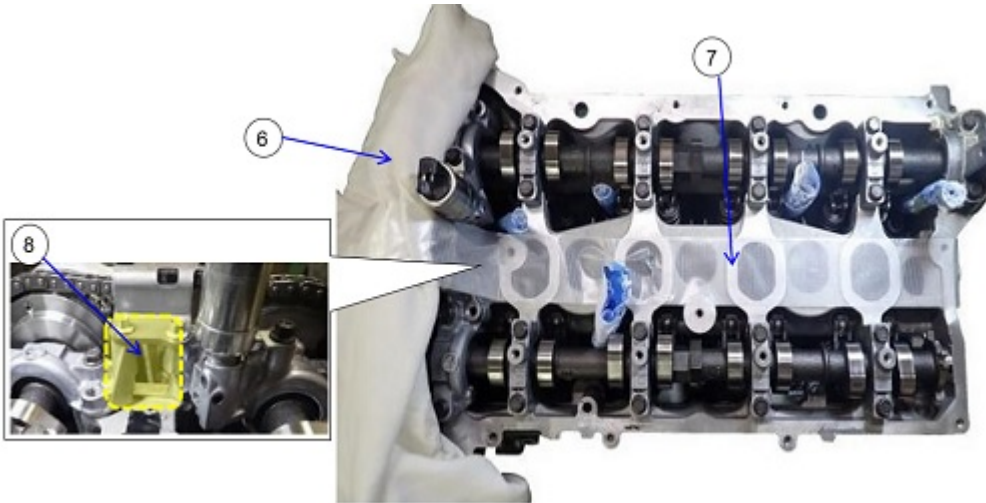


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2. When taping over openings, attach 2-1/2" wide painters tape (or equivalent) from the top of the cam tower (8) and over the spark plug holes (7).

**NOTE:**

- It is recommended to use tape that can be easily applied and removed since the long screwdriver will be inserted to verify the upper top dead center of compression for each cylinder.
- Placing a rag (6) over the timing chain area is optional as you will not be working in this area.



**(D) Valve seal replacement of the exhaust side**

**NOTE:** The figure of the SST shown in the following images may change.

**SST Main Body Installation**

1. Apply painters tape (or equivalent) to the four lower parts of the SST main body where it makes contact with the cylinder head to prevent scratches.



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2. Attach the SST main body to the oil shower pipe mounting bolts holes on the exhaust side using the included 6mm flange bolts.

**Tightening torque: 3.32 - 3.84 lbf·ft (4.5 - 5.2 N·m, 0.46 - 0.53 kgf·m)**



**NOTE: The following procedure is shown on cylinder # 3 as an example, however, the valve stem seal replacement procedure MUST be performed on all exhaust valves.**

### ***Rocker Arm Removal***

1. Insert the long screwdriver (with the length marking on the shank from the assembly instructions ) into the spark plug hole of the #3 cylinder to determine top dead center.



(1) Long screwdriver

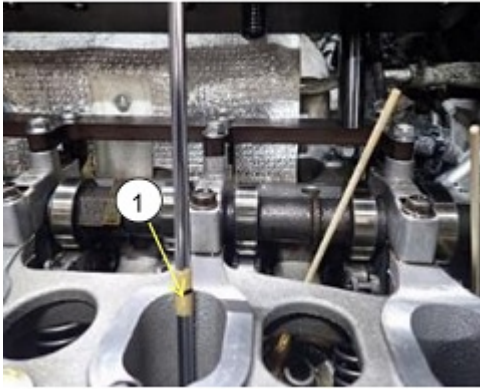
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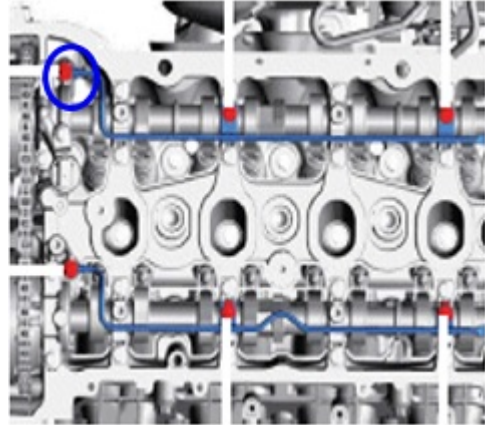
2. Rotate the crankshaft clockwise to bring cylinder #3 to top dead center of compression stroke. When the 143mm mark (1) on the screwdriver is even with the cylinder head surface and the nose of the exhaust cam lobes lean toward the spark plug hole, the cylinder is at top dead center.

**NOTE:** Rotate the crankshaft slightly clockwise and counterclockwise to bring the marking on the screwdriver to the highest position.

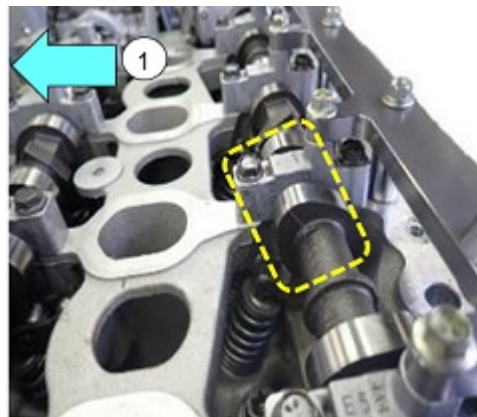
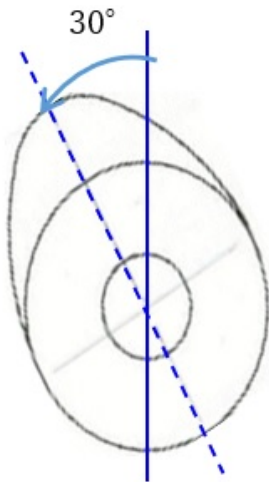
**CAUTION:** Place a rag over the oil shower pipe feed port (circled in the image) before rotating the crankshaft since engine oil may be pumped out. If oil should spill out onto the exhaust system, carefully clean it off.



(1) Marking



**NOTE:** At top dead center of compression stroke, the exhaust cam lobe nose is located approximately 30° from vertical towards the spark plug holes.

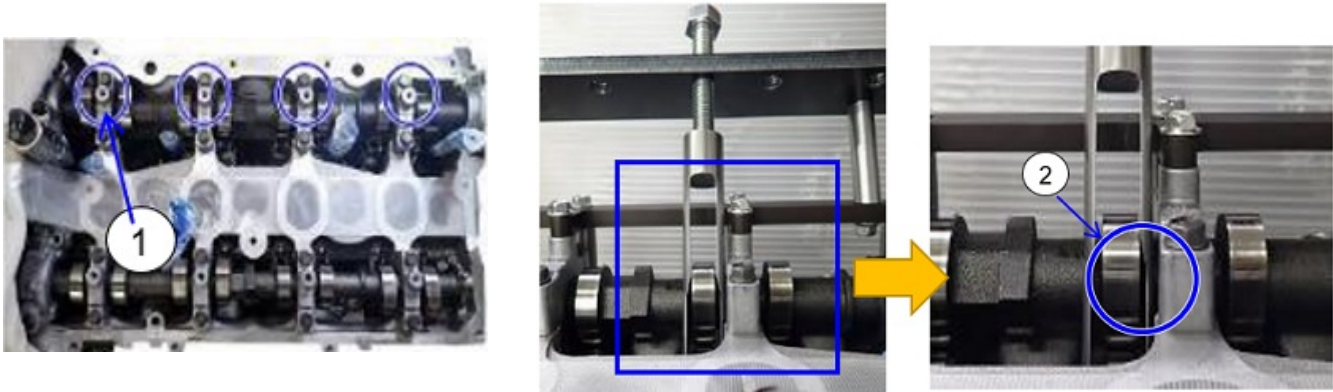


(1) Vehicle front

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3. Install the valve spring compression tool (#8) with the 12mm bolt (17mm hex head) (#15) onto the upper spring seat.  
 4. Inspect the clearance between the valve spring compression tool and the cam lobe - the space between each side of the tool and the cam lobe should be the same.

- If the tool is not centered on the cam lobe, loosen the 4 main body mounting bolts and shift the main body left or right until the tool is centered on the cam lobe, then retighten the main body mounting bolts.



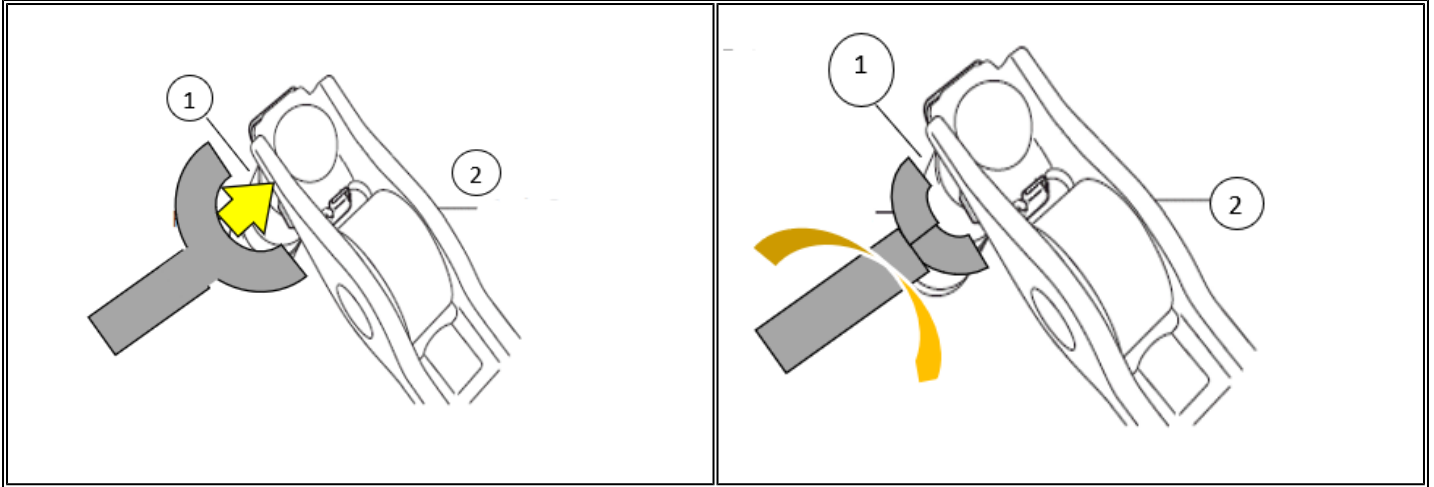
5. Push down on the rocker arm with a finger to prevent the valve keepers from separating from the upper spring seat while compressing the valve spring.



6. Compress the spring by tightening the 12mm bolt (17mm hex head) approximately 4 complete turns.  
**CAUTION: DO NOT exceed 1.48 lbf-ft (2 N·m, 0.20 kgf·m) of torque or SST damage will occur.**

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7. Detach the rocker arm from the Hydraulic Lash Adjuster (HLA) by inserting a small panel clip removal tool or flat blade screwdriver between the HLA (1) and the rocker arm (2) and applying a small twist.



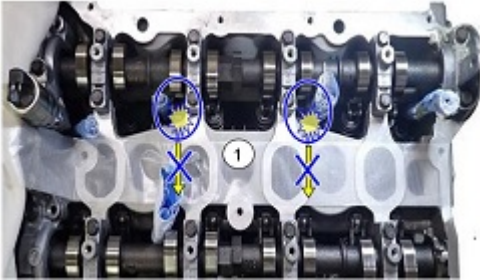
8. [For all valves except 3 and 6] Take out the rocker arm from between the spring compression tool arms by using a magnet and verify that the rocker arm HLA retaining clip is still attached to the rocker arm and is not damaged. **NOTE:**

- Check the top of the HLA if the retaining clip is missing.
- If the retaining clip is damaged, a new HLA assembly will need to be ordered because the clip is currently not available separately. The new HLA assembly comes with a rocker arm and clip.



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9. [For the two rocker arms 3 and 6 of #2 and #3 cylinder circled] Remove the rocker arms from the side using the following steps because the shape of the cylinder head casting prevents the rocker arms from being removed through the front of the spring compression tool.



a. While detaching the rocker arm from the HLA, move the rocker arm backward off the valve stem.



b. Insert a magnet behind the compression tool to raise the rear of the rocker arm to remove it and verify that the rocker arm HLA retaining clip is still attached to the rocker arm and is not damaged.

**NOTE:**

- Check the top of the HLA if the retaining clip is missing.
- If the retaining clip is damaged, you will need to order a new HLA assembly. The clip is currently not available separately. The new HLA assembly comes with a rocker arm and clip.



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**Valve Spring Removal**

1. After removing the rocker arm, loosen the 12 mm bolt (17 mm hex head) (#15) on the valve spring compression tool two to three complete turns.
2. Then tighten the 12 mm bolt (17 mm hex head) (#15) again to release the valve keepers from the upper valve spring seat. Use a magnet to remove the keepers.

**CAUTION: DO NOT exceed 1.48 lbf·ft (2 N·m, 0.20 kgf·m) of torque or SST damage will occur.**



3. Loosen the 12 mm bolt (17 mm hex head) (#15), then remove the bolt and the valve spring compression tool.

**NOTE:** Loosen the 12mm bolt the full 4 turns that it was compressed.



4. Use a magnet to remove the upper valve spring seat and valve spring.

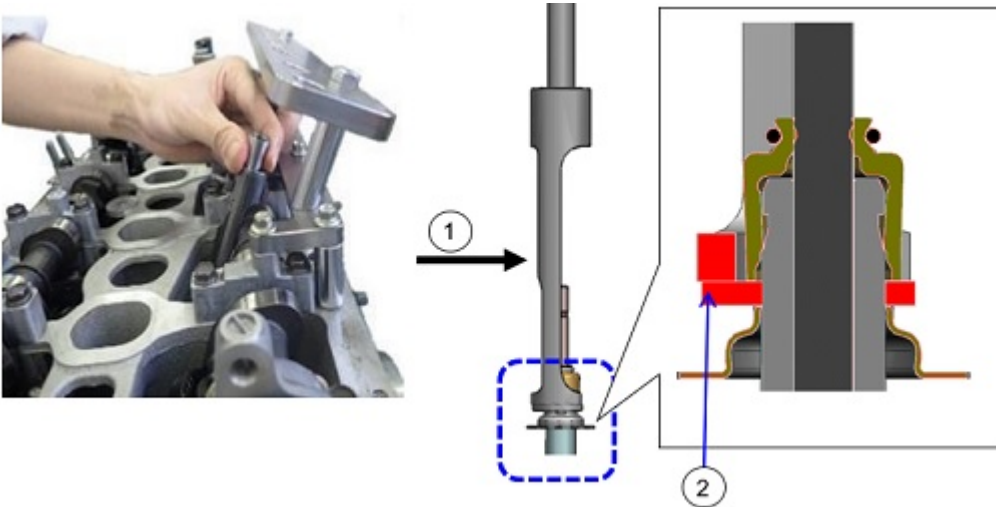
**NOTE:** Press down on the valve stem to make valve spring removal easier. The valve will rest on the piston if properly set at top dead center of the compression stroke.

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### Valve Seal Removal

1. Place the valve seal removal tool (#7, #13, #14) under the valve seal as shown.



- (1) Press lightly into place.
- (2) Hook the lower end of the valve seal to the step of the inner wall.

2. Put the valve seal removal attachment tightening bolt 8mm thread (12mm head) (#14) with the M10 washer (#13) through the SST main body.

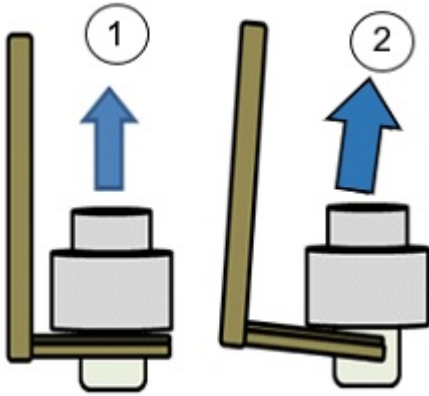


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3. Tighten the 8mm bolt to remove the valve seal in the direction of the arrow shown.

**NOTE:** Once the valve seal is released, the tightening torque will become light.

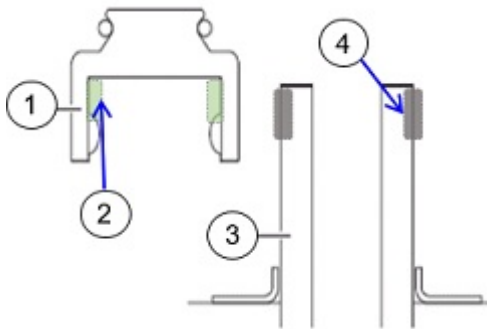
**CAUTION:** The SST could be damaged if not placed properly under the valve seal.



(1) Good

(2) Not Good

4. Clean and degrease the valve guide and surrounding area with a rag and inspect the valve guide groove and valve guide to remove any remaining rubber residuals from the old oil seal.



- (1) Valve seal
- (2) Inner rubber
- (3) Valve guide
- (4) Residuals

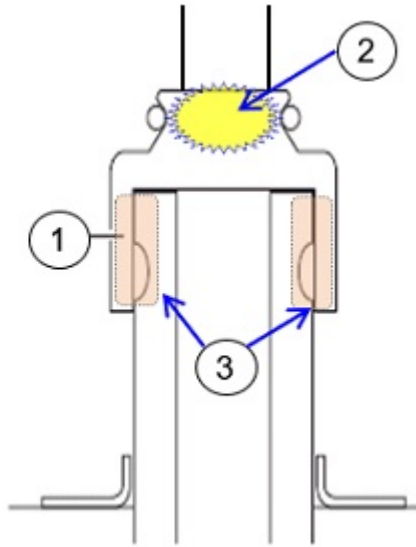
5. Remove valve seal removal tool along with the 8mm bolt and washer.

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### Valve Seal Installation

1. Gently lubricate the lip of the new valve seal with clean engine oil.

**NOTE:** DO NOT lubricate the inside of the valve seal.



- (1) Valve seal
- (2) Lubrication
- (3) DO NOT lubricate.

2. Install the new oiled valve seal on the valve stem and press down until the seal is seated on top of the valve guide.



(1) New valve seal

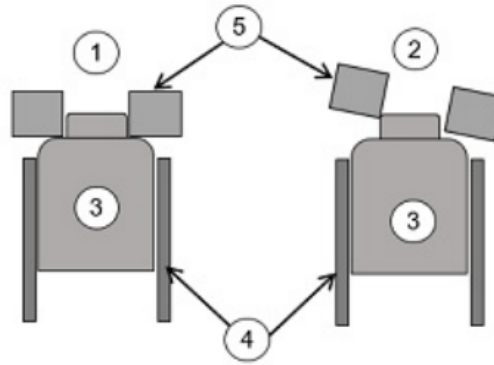
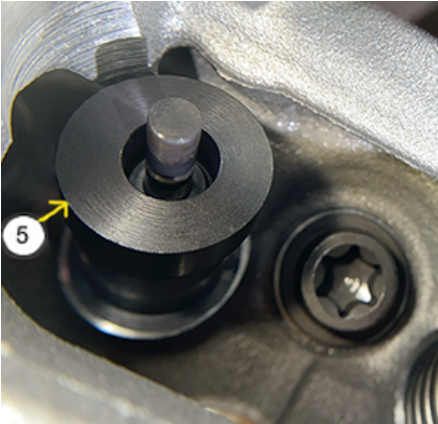
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3. Place the valve seal installation tool A over the valve guide and seal and verify the tool is sitting on the lower valve spring seat.



(1) Valve seal installation tool A (#10)

4. Place the valve seal installation tool B (#9) on the valve seal and make sure the valve stem is in the center of installation tool B.



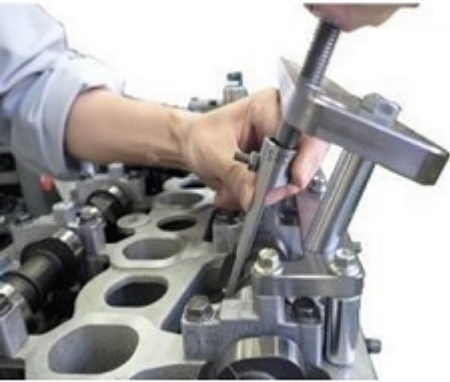
[Image of the set of the valve seal installation tools A and B]

- (1) Good
- (2) No good
- (3) Valve seal
- (4) Valve seal installation tool A (#10)
- (5) Valve seal installation tool B (#9)

5. Place the valve spring compression tool on the valve seal installation tool B (#9).

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6. Install the 12mm bolt until it makes contact with the valve spring compression tool.



7. Using a torque wrench, tighten the 12mm bolt to 0.74 - 1.48 lbf-ft (1 - 2 N·m, 0.10 - 0.20 kgf·m) to install the new valve guide seal on to the valve guide.

**NOTE:** The valve guide seal will be properly seated when tool B contacts tool A.

**CAUTION: DO NOT exceed 1.48 lbf-ft (2 N·m, 0.20 kgf·m) of torque or SST damage will occur.**

8. Remove the valve spring compression tool and the valve seal installation tools A and B.



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9. Prepare the valve seal height checker (#16, #17).

**NOTE:** If it is difficult to confirm the height of the SST because of its black exterior, mark the 5mm from the top of the inner cylinder with a white pen.



(1) Outer Cylinder  
(2) Inner Cylinder

10. Attach the valve seal height checker (#16, #17) on top of the valve seal installed in step 5.

**NOTE:** Install the height checker with the notch facing the camshaft side (1). If it is difficult to install by hand, use a magnet.

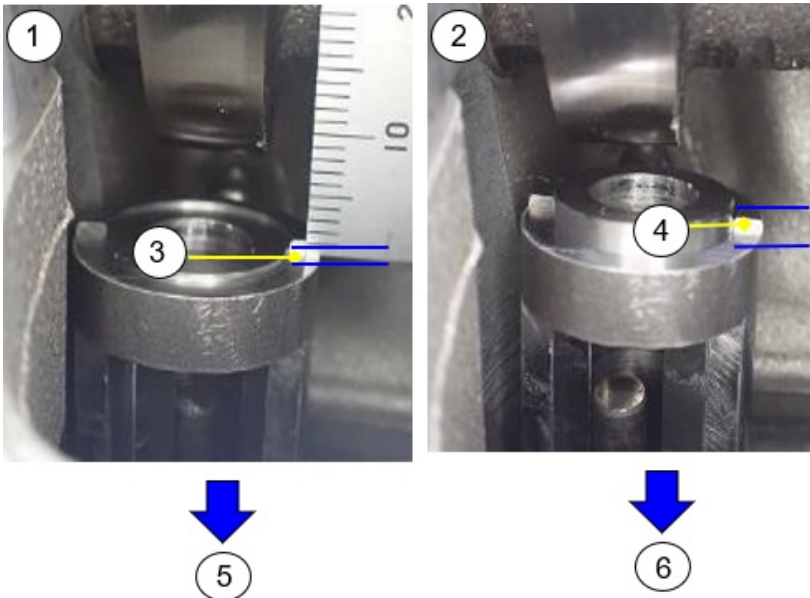
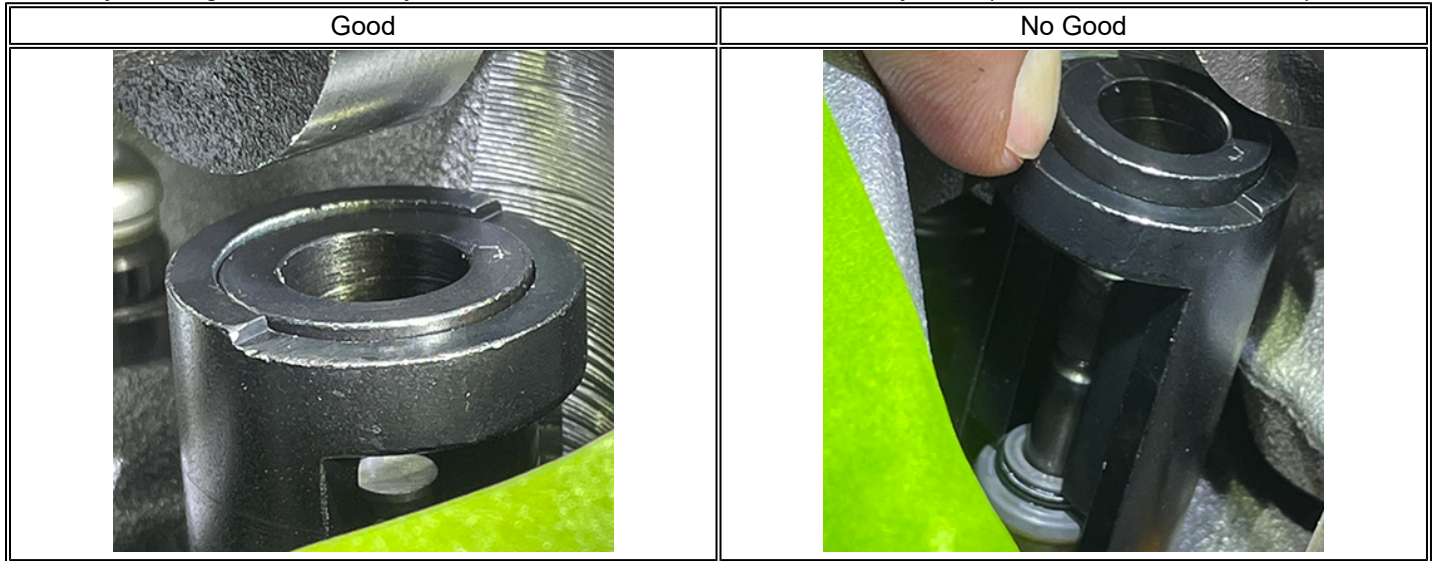


11. Rotate the height checker 180 degrees so the open side faces the front of the vehicle.



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12. Verify the height of the inner cylinder is within the OK level of the outer cylinder (within the notch difference).

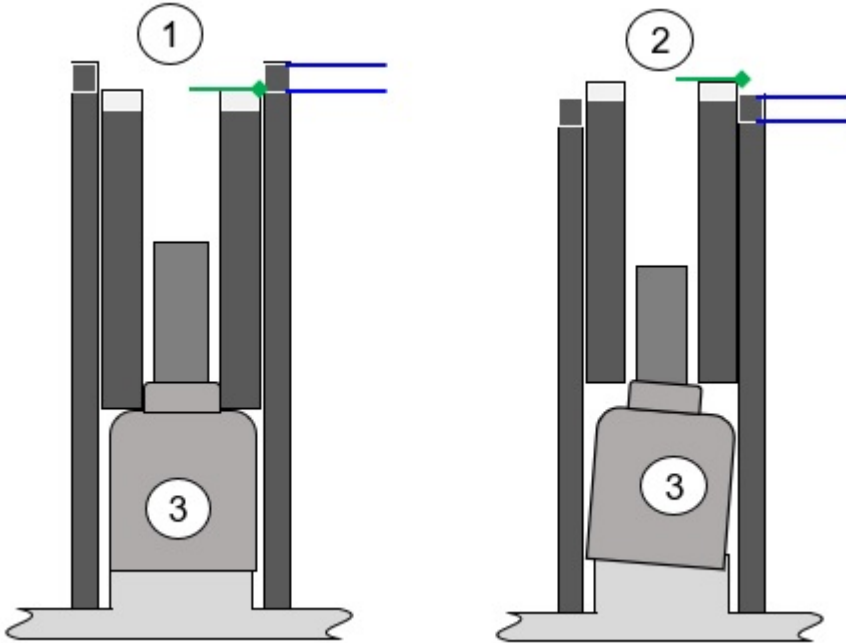


- (1) Good
- (2) Not good
- (3) The inner cylinder is within the step (OK range) of the outer cylinder (same height is also acceptable).
- (4) The inner cylinder exceeds beyond the step of the outer cylinder.
- (5) Remove the height checker and proceed to "Valve spring installation".
- (6) Remove the valve seal height checker and inspect the valve seal.

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- If the seal height is too high, remove the checker, install the seal installation tools A and B and the valve spring compression tool and tighten the 12mm bolt to 2Nm (torque specs), then recheck the seal height.
- If the seal height is still too high, remove the seal and inspect the valve guide for debris or other blockage. Once the obstruction has been removed, install a new seal.

[Determination of the height check]



- (1) Good  
 (2) No good  
 (3) Valve seal

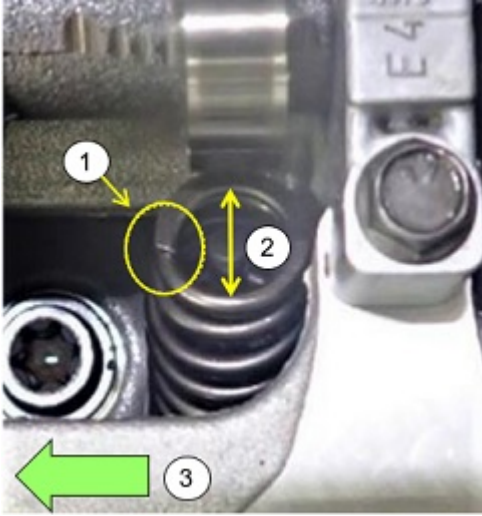
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### Valve Spring Installation

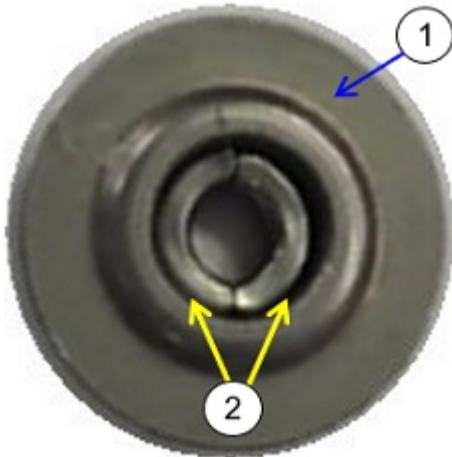
1. Place the valve spring on the lower valve spring seat with the smaller spring diameter facing up.

**NOTE:** To make valve keeper installation easier, the spring end should be at 9 o'clock position.



- (1) The end of spring
- (2) Spring diameter
- (3) Engine front

2. Place the keepers in the upper valve spring seat with the separations at 12 o'clock and 6 o'clock positions.



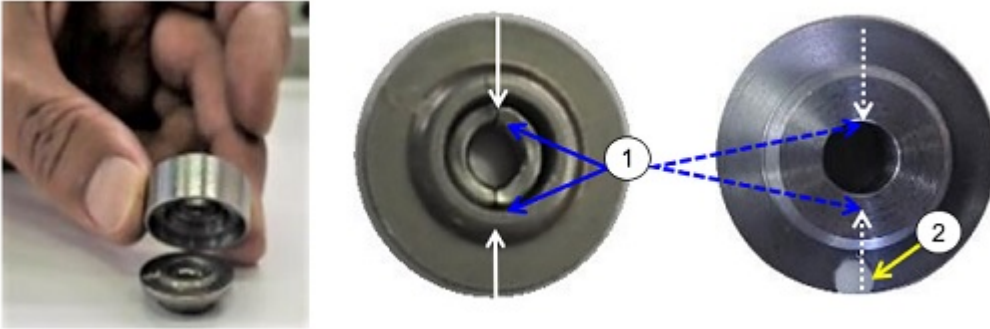
- (1) Valve seat
- (2) Keeper

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3. Place the valve keeper installation tool (#11, #12, #18) on top of the upper valve spring seat.

**NOTE:**

- Align the white dot on the valve keeper installation tool (#11, #12, #18) with the slit of the keepers.
- The tool as it is shipped does not have a white dot on the face (2), a paint marker must be used to add the white dot.



- (1) Slit of the keeper  
(2) White dot for slit identification

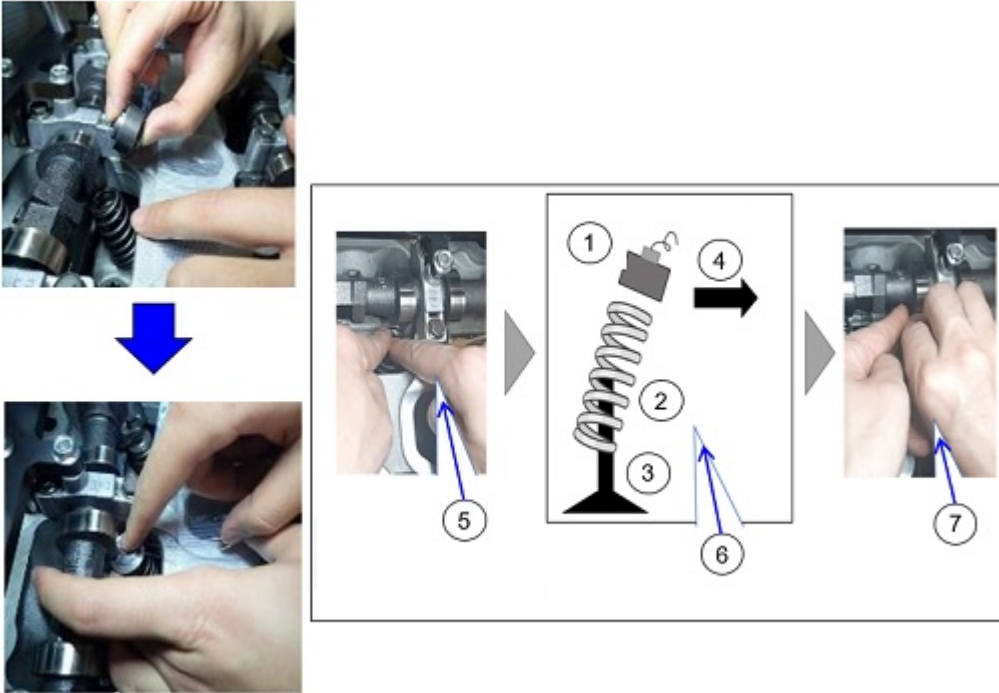
4. Insert the valve keeper installation guide into the hole of the keeper installation tool.



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5. Hold the assembled valve keeper installation tools (#11, #12, #18) between your index finger and thumb and install them on the valve spring.

**NOTE:** To make placing the assembled valve keeper installation tools (#11, #12, #18) easier, press the valve down into the engine and tilt the spring toward you.

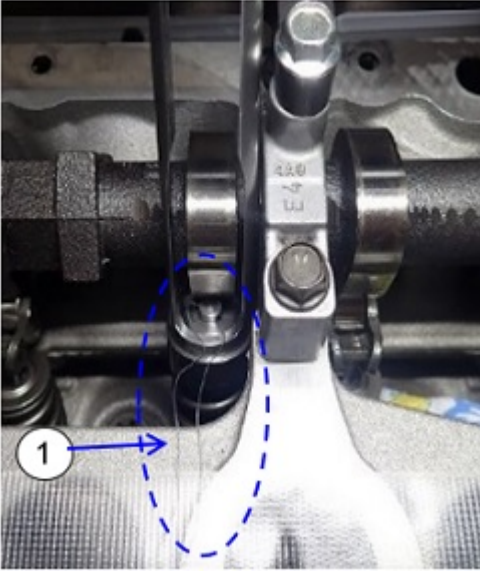


- (1) Valve keeper installation tool (#11, #12, #18) and guide
- (2) Spring
- (3) Valve
- (4) Vehicle front
- (5) To free the spring, push the valve in with your finger until it hits the piston.
- (6) Tilt the spring toward the front of the vehicle.
- (7) Insert the valve keeper installation tool (#11, #12, #18) and guide.

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6. Place the valve spring compression tool on top of the valve keeper installation tools (#11, #12, #18).

**CAUTION: DO NOT** remove the valve keeper installation guide (1) before the valve stem pushes it out.



Pass the wire (1) of the valve keeper installation guide between the valve spring compression tool.

7. With a finger pushing down on the valve keeper installation guide, slowly tighten the 12mm bolt (17mm hex head) (#15) with the torque wrench.

**CAUTION: DO NOT exceed 1.48 lbf·ft (2 N·m, 0.20 kgf·m) of torque or SST damage will occur.**

**NOTE:**

- The valve keeper installation guide is pushed out of the installation tool as the bolt is tightened.
- As the 12mm bolt is tightened the valve keeper installation guide will contact the top of the valve stem and will be pushed up and out to the valve keeper installation tool. Once the guide is pushed out, remove it.

**CAUTION:**

- If the torque increases while tightening the 12mm bolt (17mm hex head), the valve keeper installation tool (#12) may be interfering with the valve stem.
- If the bolt is continued to be tightened with this condition, the valve spring compression tool and valve will be damaged. Stop and loosen the bolt and move the valve keeper installation tool (#12) back and forth or left and right until the valve stem is in the center of the tool. Then, slowly tighten the bolt again.
- If the valve keeper installation guide does not get pushed up and out of the tool, loosen the bolt, remove the valve spring compression attachment and verify that the piston is at top dead center.

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8. Once the valve keeper installation guide is pushed up and out, keep tightening the bolts until the tip of the valve stem rises about 1/8 - 3/16 in (3 - 5 mm) from the top of the valve keeper installation tool (#12).

**NOTE:** If the valve stem tip does not protrude more than 1/8 - 3/16 in (3 - 5 mm) above the valve keeper installation tool after the valve spring is fully compressed (torque wrench indicates 0.74 - 1.48 lbf·ft (1 to 2 N·m, 0.10 - 0.20 kgf·m), the valve may be too low due to the cylinder not being exactly at top dead center of compression. In this case, remove each tool, pull the valve stem up to close the valve with your fingers and start over.



(1) 1/8 - 3/16 in (3 - 5 mm)

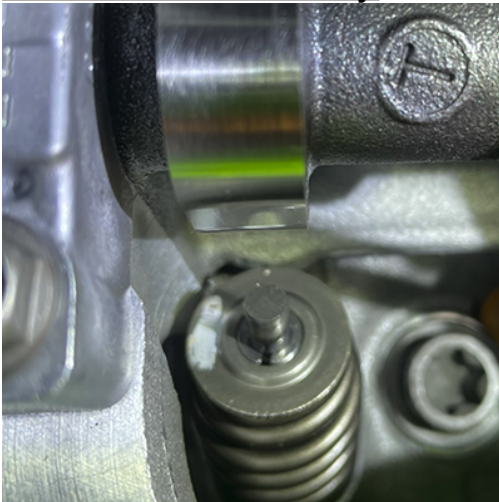
9. Loosen the 12mm bolt (17mm hex head) and remove the spring compressor tool.

10. Remove the valve keeper installation tool (#11, #12, #18).

11. Inspect and verify the valve keepers are correctly installed in the upper valve spring seat.

**[Correct Installation]**

**CAUTION: Starting the engine with the keepers NOT installed correctly will cause catastrophic engine failure, NOT covered under Warranty.**



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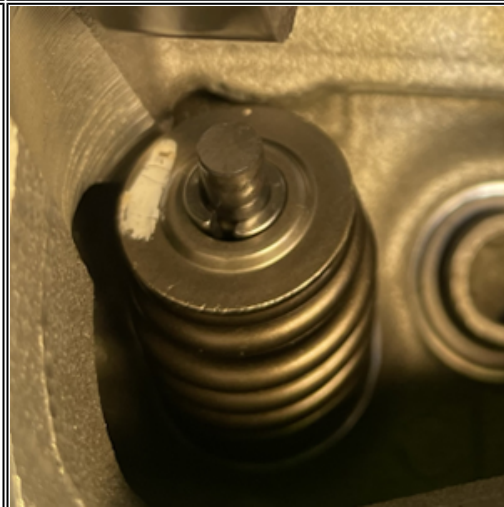


**[Incorrect installation]**

One (or both) of the keepers are floating.

- If the keepers are not installed correctly, reinstall the valve keeper installation tool without the guide and tighten it to 1.48 ft-lbs (2 Nm).
- If the keepers are still not installed correctly, remove the tools, keepers, and upper spring seat, then pull the valve stem up by hand and verify the piston in the cylinder you are working on is exactly at TDC of the compression stroke and start over.

**CAUTION: DO NOT attempt to raise the valve by rotating the engine, otherwise damage to the valve will occur.**



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### ***Rocker Arm Installation***

1. Install the valve spring compression tool on the upper valve spring seat.



2. Push down on the valve stem with a finger to prevent the valve keepers from separating from the upper spring seat while tightening the 12mm bolt to compress the valve spring.

3. Continue pressing down on the valve stem while tightening the 12mm bolt approximately 5 complete turns.

**CAUTION: DO NOT exceed 1.48 lbf-ft (2 N·m, 0.20 kgf-m) of torque or SST damage will occur.**



4. Inspect the rocker arm HLA clip and make sure the clip is securely attached. Replace any clip that is damaged or bent.  
**NOTE:** The new HLA assembly comes with a rocker arm and clip.

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## 5. Insert the rocker arm.

a. Valves 3 and 6: will require the rocker arm to be installed from the side of the valve spring compression tool. Refer to Rocker Arm Removal for details.



b. All other valves: The rocker arm can be installed between the valve spring compression tool arms using a magnet.

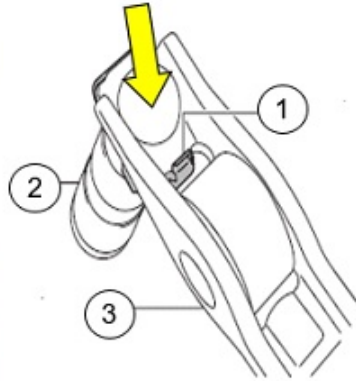
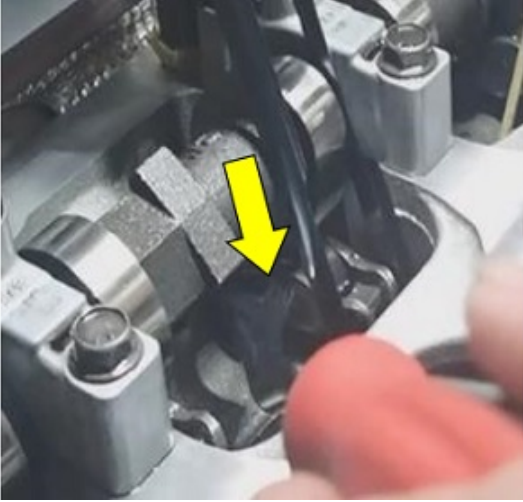


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6. Push the rocker arm on to the HLA ball using the fastener remover tool or finger, until the clip is locked on to the HLA ball.

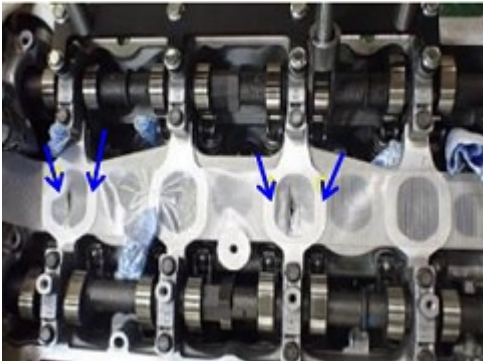
**NOTE:** A click will be heard when the metal clip locks onto the HLA ball. To verify if the rocker is properly secured to the HLA, use a pick and gently lift the rocker. If clip takes the HLA up with it, it is securely attached



- (1) Clip
- (2) HLA
- (3) Rocker arm

7. Loosen the 12mm bolt (17mm hex head) and verify that the rocker arm is installed correctly.

**NOTE:** Put a mark on the masking tape next to the valve worked on.



8. Rotate the crankshaft clockwise and follow the same procedure to replace the valve seals on the remaining cylinders.

9. Remove the SST and painters tape.

10. Remove the oil drain back plugs and rag (if previously installed over timing chain area).

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**(E) Related Parts Reassembly**

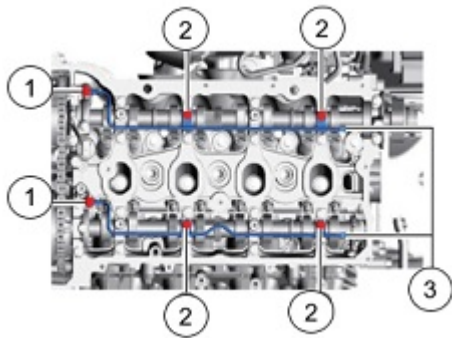
1. Install the spark plug.

**Tightening torque for spark plug: 11.06 - 14.75 lbf·ft (15 - 20 N·m, 1.53 - 2.04 kgf·m)**

2. Tighten the mounting bolts (2) of the oil shower pipe (3) and the oil feed banjo bolt (1) on the exhaust side in the order of the numbers shown in the figure.

**NOTE:**

- Wipe off the oil before tightening, as oil adhesion will cause over-torque.
- Hand tighten the oil feed banjo bolt (1) and oil feed pipe mounting bolts (2). Torque the oil feed banjo bolt to spec then torque the feed pipe mounting bolts to spec.

**Tightening torque spec:**

**(1) Oil feed banjo bolt: 6.64 - 8.85 lbf·ft (9 -12 N·m, 0.92 - 1.22 kgf·m)**

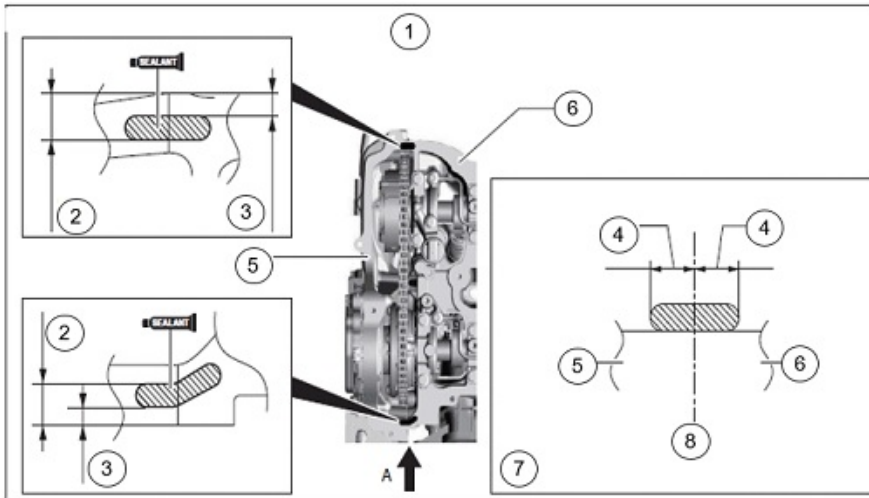
**(2) Oil feed pipe mounting bolts: 0.92 - 6.64 lbf·ft 8 -9 N·m (0.82 - 1.22 kgf·m)**

**(3) Oil shower pipe**

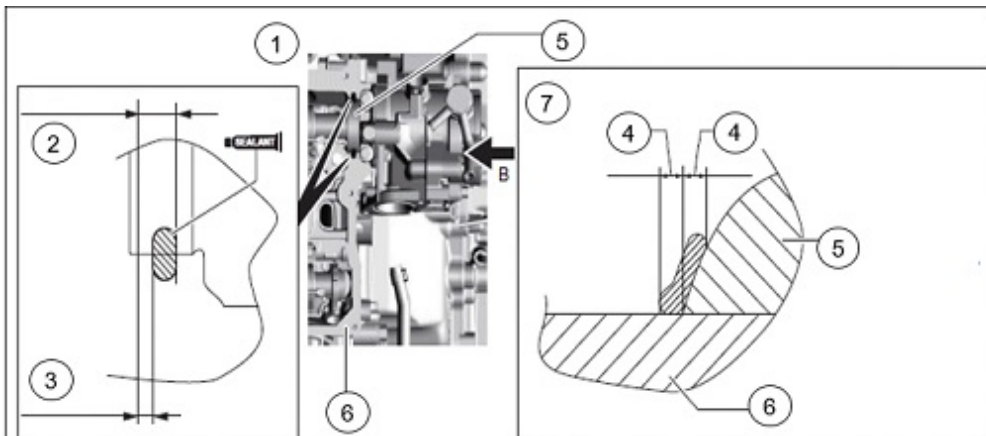
3. Install a new cylinder head cover gasket into the groove of the cylinder head cover.

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4. Apply liquid gasket (TB1217D) at the locations shown in the figure.



- (1) Engine-front side
- (2) 0.23 - 0.31" (6 - 8mm)
- (3) 0.04 - 0.12" (1 - 3mm)
- (4) 0.12 - 0.51" (3 - 13mm)
- (5) Engine front cover
- (6) Cylinder head
- (7) Arrow A
- (8) Mating surface of the engine front cover



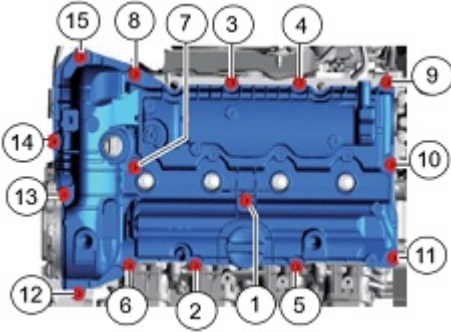
- (1) Engine-rear side
- (2) 0.23 - 0.31" (6 - 8mm)
- (3) 0.04 - 0.12" (1 - 3mm)
- (4) 0.08 - 0.23" (2 - 6mm)
- (5) Rear camshaft cap at the exhaust side
- (6) Cylinder head
- (7) Arrow B

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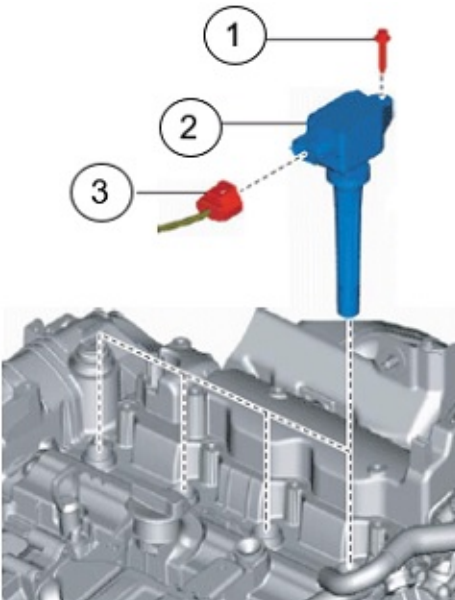
5. Install the cylinder head cover.

6. Tighten the cylinder head cover bolts in numerical order, as shown in the figure.

**Tightening torque: 3.32 - 5.16 lbf·ft (4.5 □ 7.0 N·m, 0.46 - 0.71 kgf·m)**



7. Install the ignition coil/ion sensor.



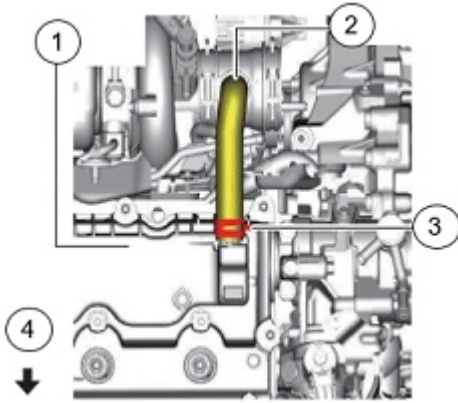
(1) Bolt: 5.90 - 8.11 lbf·ft (8 - 11 N·m, 0.82 - 1.12 kgf·m)

(2) Ignition coil/ion sensor

(3) Connector

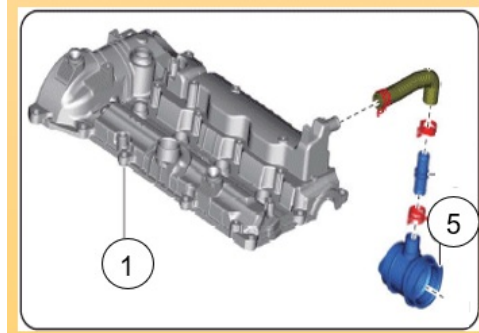
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8. Connect the breather hose.



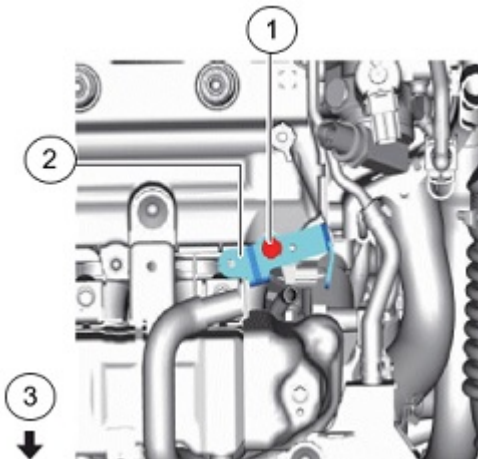
**For the US specification]**

Install the breather hose with the turbocharger air inlet hose (5) and the head cover assembly (1) since they are clamped together.



- (1) Cylinder head cover
- (2) Breather hose
- (3) Clip
- (4) Vehicle front

9. Install the harness bracket.

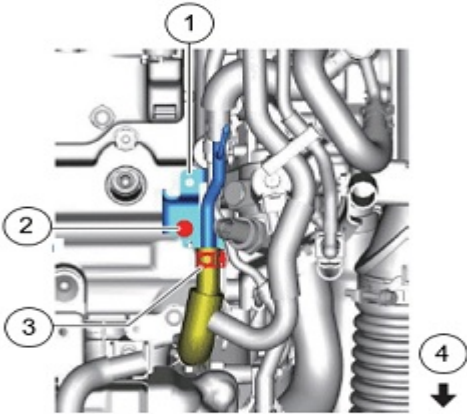


- (1) Bolt: 5.90 - 8.11 lbf·ft (8 - 11 N·m, 0.82 - 1.12 kgf·m)
- (2) Harness bracket
- (3) Vehicle front

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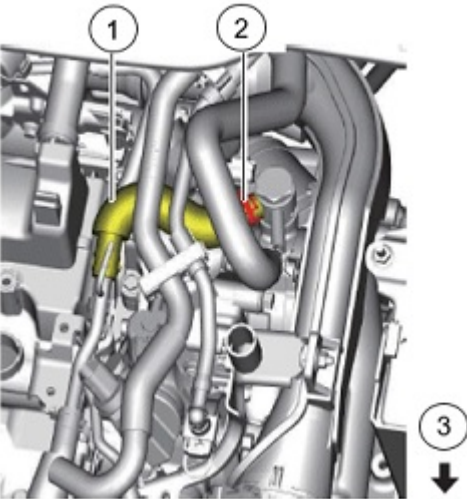


10. Connect the hose and attach the air pipe assembly.



- (1) Air pipe assembly
- (2) Bolt: 5.90 - 8.11 lbf·ft (8 - 11 N·m) (0.82 - 1.12 kgf·m)
- (3) Clip
- (4) Vehicle front

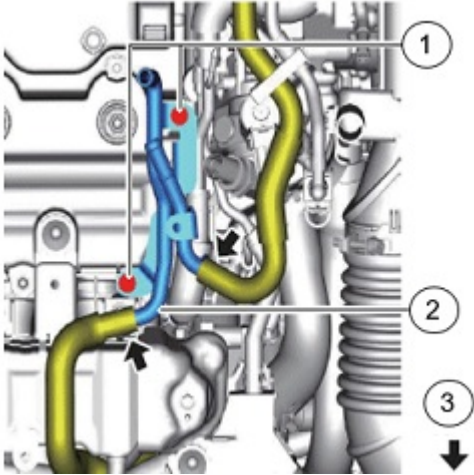
11. Install the vacuum hose.



- (1) Vacuum hose
- (2) Clip
- (3) Vehicle front

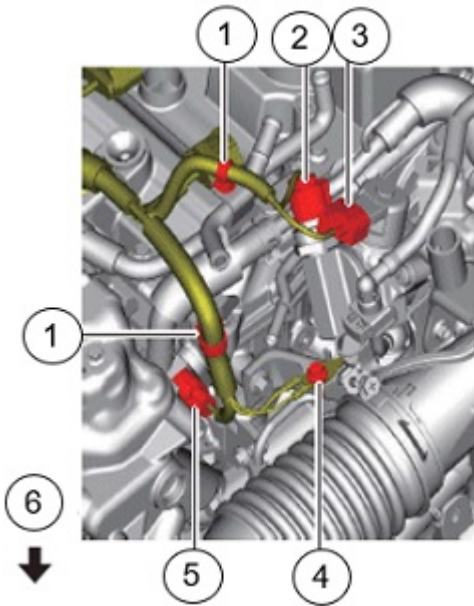
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12. Connect the hose of the vacuum pipe assembly and install the vacuum pipe assembly.



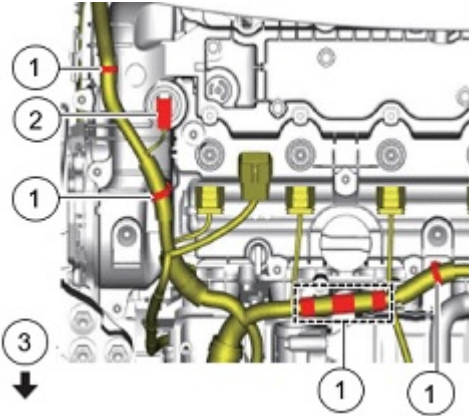
- (1) Bolt: 5.90 - 8.11 lbf·ft (8 - 11 N·m, 0.82 - 1.12 kgf·m)
- (2) Vacuum pipe assembly
- (3) Vehicle front

13. Connect the parts shown in the figure.



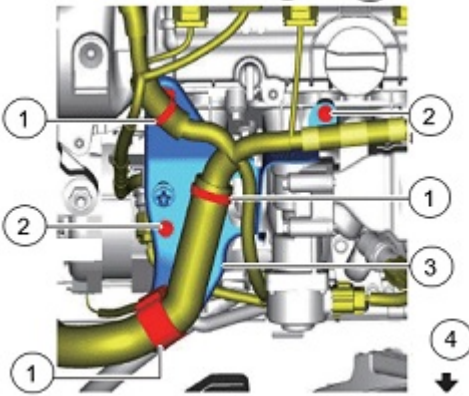
- (1) Harness clip
- (2) Fuel pressure sensor connector
- (3) High-pressure fuel pump connector
- (4) Bolt: 5.90 - 8.11 lbf·ft (8 - 11 N·m, 0.82 - 1.12 kgf·m)
- (5) Camshaft position sensor connector
- (6) Vehicle front

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- (1) Harness clip
- (2) OCV connector
- (3) Vehicle front

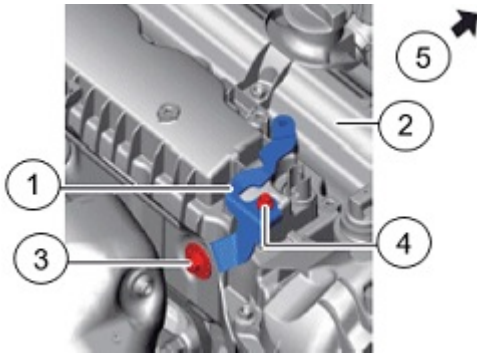
14. Install the bolts, clips, and harness bracket shown in the figure.



- (1) Harness clip
- (2) Bolt: 5.90 - 8.11 lbf·ft (8 - 11 N·m, 0.82 - 1.12 kgf·m)
- (3) Harness bracket
- (4) Vehicle front

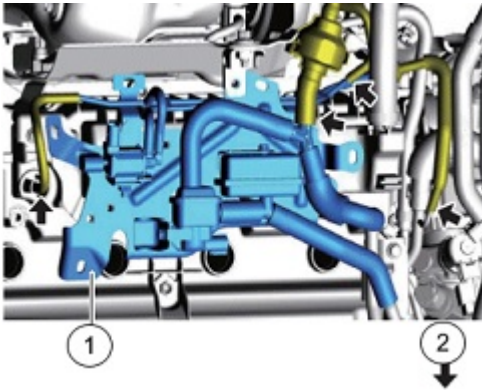
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15. Install the bolts and bracket.



- (1) Bracket
- (2) Cylinder head cover
- (3) Bolt: 6.64 - 8.85 lbf·ft (9-12 N·m, 0.92 - 1.22 kgf·m)
- (4) Bolt: 5.90 - 8.11 lbf·ft (8-11 N·m, 0.82 - 1.12 kgf·m)
- (5) Vehicle front

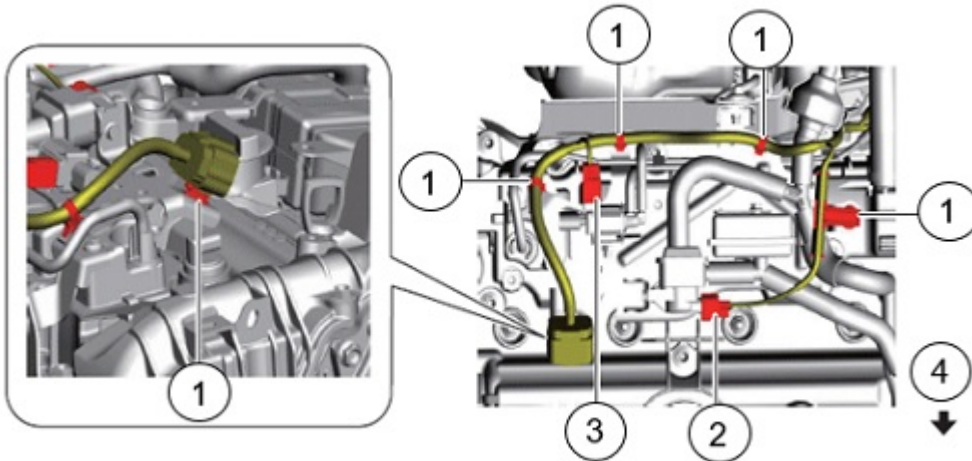
16. Connect the hose and install the purge solenoid bracket assembly.



- (1) Purge solenoid bracket assembly
- (2) Vehicle front

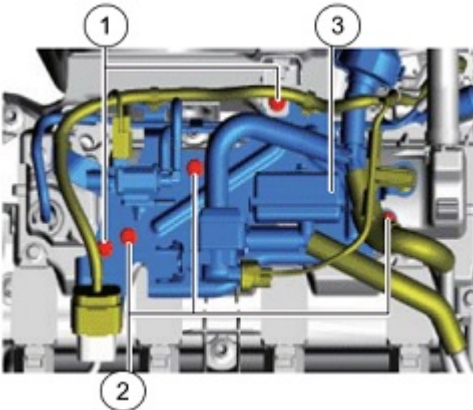
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17. Connect the connectors and four clips.



- (1) Harness clip
- (2) Purge solenoid valve connector
- (3) Solenoid valve connector
- (4) Vehicle front

18. Install the bolts shown in the figure.

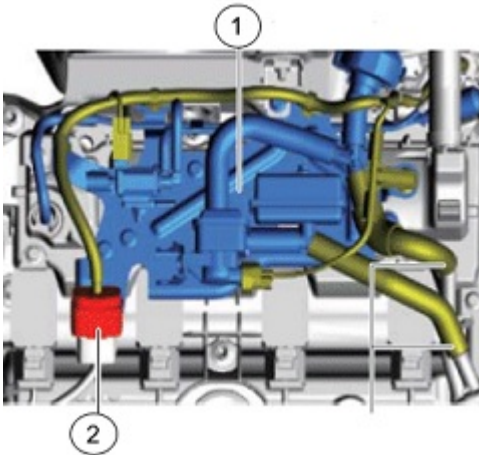


- (1) Bolt: 5.90 - 7.38 lbf·ft (8 - 10 N·m, 0.82 - 1.02 kgf·m)
- (2) Bolt: 5.90 - 8.11 lbf·ft (8 - 11 N·m, 0.82 - 1.12 kgf·m)
- (3) Purge solenoid valve assembly

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19. Connect the connector.



- (1) Purge solenoid valve assembly  
 (2) Connector

20. Attach the plug hole plate.

21. Connect the negative battery (-) terminal.

22. Perform the steps after connecting the negative battery (-) cable according to the instructions on MGSS (NEGATIVE BATTERY TERMINAL DISCONNECTION / CONNECTION).

#### PARTS INFORMATION

Parts Number	Description	Qty.	Notes
PY8W-10-1F5	Seal, Exhaust Valve	8	
PY8W-10-235	Gasket, Head Cover	1	[R]: Replacement Part

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**WARRANTY INFORMATION****NOTE:**

- This warranty information applies only to verified customer complaints on vehicles eligible for warranty repair.
- This repair will be covered under Mazda's Powertrain Warranty term.
- Additional diagnostic time cannot be claimed for this repair.
- **This repair can only be performed by Senior and Master Technicians.**

Warranty Type	A
Symptom Code	16
Damage Code	99
Part Number Main Cause	PY8W-10-1F5
Quantity	0 (Topping off engine oil only) 8 (Replacing valve seals with new ones)
Operation Number / Labor Hours:	XXW3TCRX / 4.4 Hrs (Checking for oil leak and top off engine oil and replacing valve seals with new ones)

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