Service Information

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Category		Ref. No.	Page
BD	**Repair Guidance**	R074/14C	1 of 15

Coverage	Date Issued
☐ Distributor only ■ Please inform your dealers	September 26, 2014
Please convey this information to your ☐ Director ■ General Manager ■ Warranty Dept. ■ Parts Dept. ■ Training Dept. ■ Field Rep.	Date Revised February 05, 2015

Applicable Model	Applicable Countries or Specifications
CX-5 (KE), Mazda6 (GJ), Mazda3 (BM): with SKYACTIV-D 2.2	Europe

REVISED

Revision Note:
"PARTS INFORMATION" and "BEGINNING VIN & DATE OF MODIFICATION" have been revised.
"Attachment: SH Exhaust Camshaft Removal/ Installation" has been added.

Subject: Lack of acceleration and/or unusual brake pedal feeling "SKYACTIV-D 2.2" Prior Approval is required

DESCRIPTION
Some vehicles may exhibit one or more of the following concerns with/without the following DTC(s) stored in PCM memory.
- Acceleration performance has become poor
- Unusual brake pedal feeling
- White smoke from exhaust system while driving
- MIL on with DTC P0299, P02CB and/or P2263

PROCEDURE
When you encounter customer complaints on this concern, use the following diagnosis and repair procedure. **Note that prior approval is required.**

Outline of diagnosis and repair procedure:
1. Inspect the vacuum pump for OK/NG condition.
2. Inspect the turbocharger for OK/NG condition.
   - If the vacuum pump and/or the turbocharger were found NG condition from the result of the above inspection 1 and 2, proceed to next step 3.
   - If both the vacuum pump and the turbocharger were found OK condition, this Service Information is not applicable. Refer to Workshop Manual for diagnosis.
3. Perform engine flushing with flushing oil, and replace engine oil and oil filter
4. Inspect the exhaust camshaft for OK/NG condition.
   - If the exhaust camshaft was found OK condition, this Service Information is not applicable. Refer to Workshop Manual for diagnosis.
5. Replace the following parts if judged NG by inspection:
   1) Vacuum pump (If NG by inspection at STEP 1).
   2) Turbocharger (If NG by inspection at STEP 2).
   3) Exhaust camshaft and rocker arms (If NG by inspection at STEP 4).

STEP 1: Vacuum pump performance inspection
Using M-MDS, inspect the vacuum pump performance by measuring the vacuum pressure.
Be sure to record and to keep a session file until the vehicle's warranty period expires. Please refer to S/I E005/10.

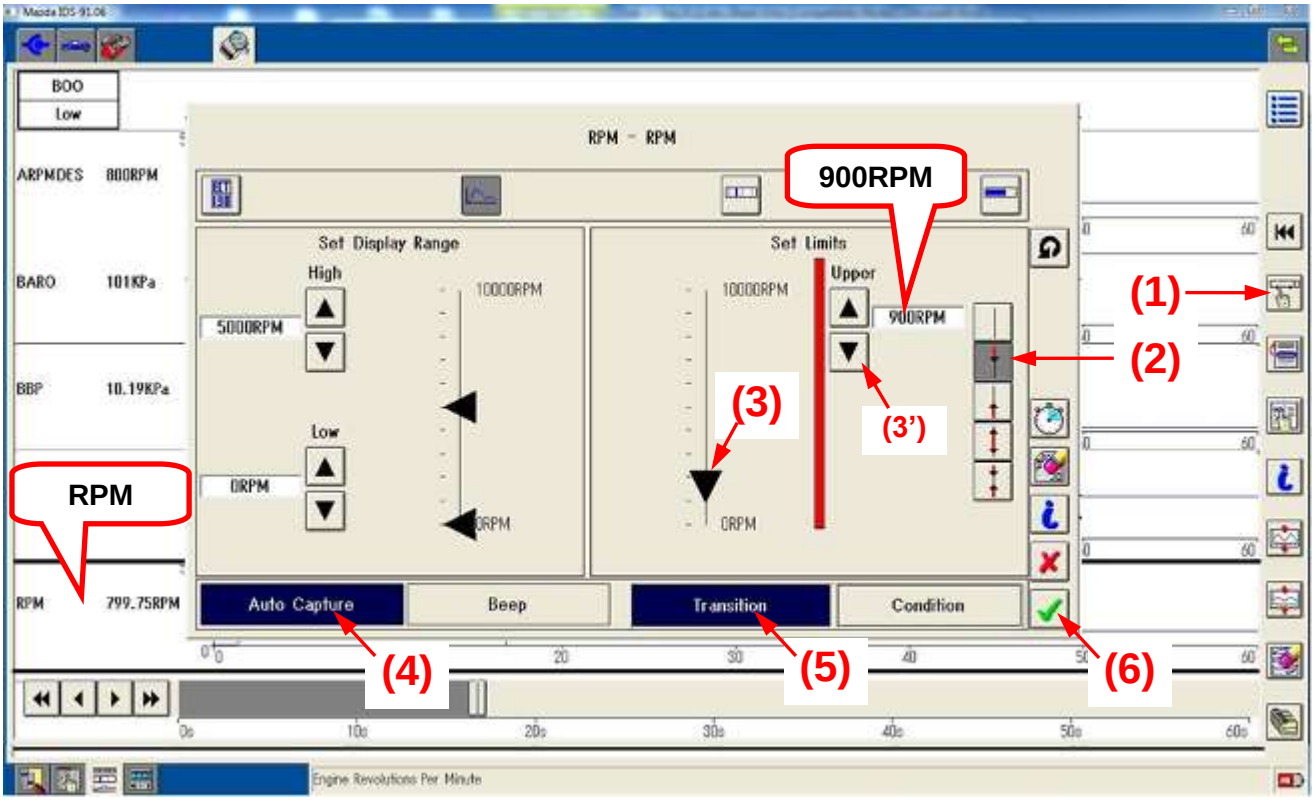
Complete engine warm-up before proceeding.

1. Turn the ignition switch ON and select datalogger→PCM→BARO, BOO, BBP, RPM, ARPMDES, and ECT.
   BARO: Atmosphere pressure
   BOO: Brake switch
   BBP: Power brake unit vacuum
   RPM: Engine rpm
   ARPMDES: Target engine rpm
   ECT: Engine coolant temperature
2. Looking at datalogger, repeatedly depress the brake pedal until the value of BBP reaches 101 KPa.

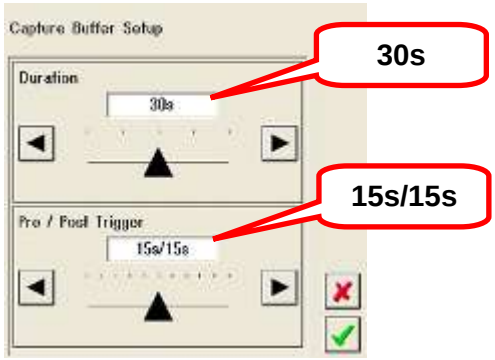
   Service Point: When the BARO value is below 100 KPa due to high altitude, repeatedly depress the brake pedal until the BBP value becomes nearly equal to the BARO value.

After selecting RPM, click "Format/limit/range" button (1)  to open the below window.

3. Click the "Upper limit only" button (2)  , then set UPPER LIMIT to 900 rpm with the button (3) or (3').
4. Click to select AUTO CAPTURE (4) and TRANSITION (5).
5. Click the button (6) ✓ to close the window.

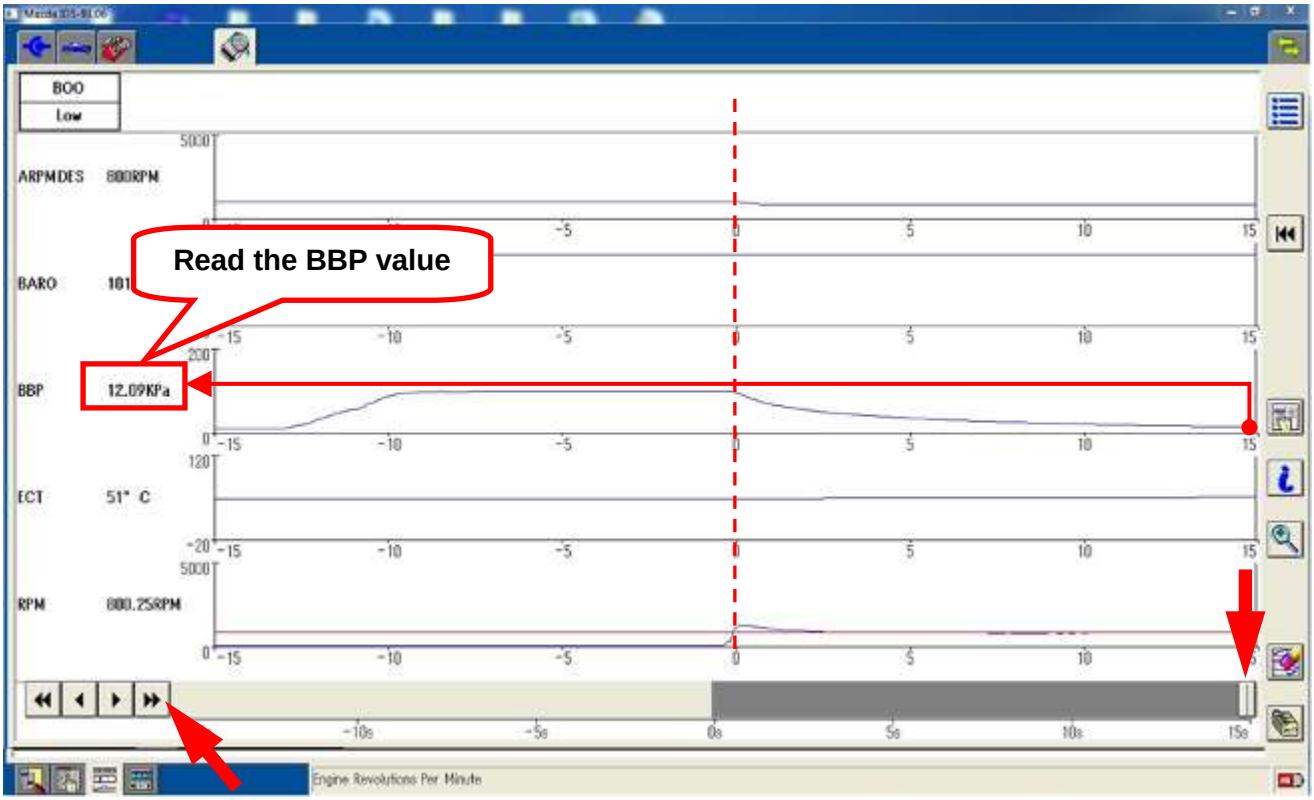


6. Click the button  to open the capture buffer setup window. Set the duration to 30s (15s/15s for Pre/Post Trigger), then click ✓ button to close the window.



7. Start the engine and simultaneously release the brake pedal, and keep it idling until the capture of 15s has been completed. Then stop the engine.

8. Click the button  to read the recorded data.
Click the button to move the bar  to the far right, then read the BBP value.

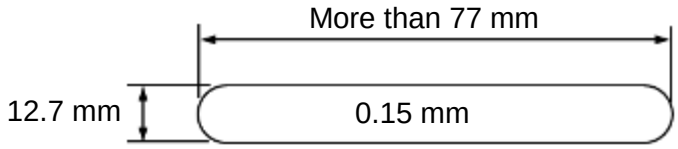


JUDGMENT:
If the BBP value is more than 35KPa:
➔ **The vacuum pump is NG. Go to STEP 2.**
If the BBP value is 35KPa or less:
➔ **The vacuum pump is OK. Go to STEP 2.**

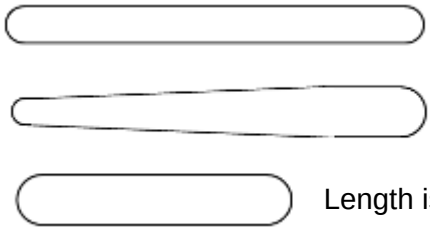
STEP 2: Turbo charger inspection

Remove the air inlet hose to Large-type turbo charger, and check the turbine shaft for free play by the following procedure.

Prepare a 0.15 mm thickness gauge with the width of 12.7 mm and the length of more than 77 mm.



The figures below show unsuitable gauges. Do not use for this inspection.



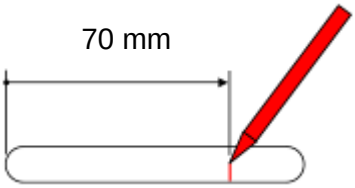
Width is not 12.7 mm

Tapered shape

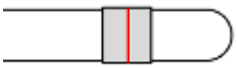
Length is less

NOTE: Do not use two or more blades in combination to adjust thickness to 0.15 mm. The gauge will warp, and thus this inspection cannot be performed correctly.

1. Draw a straight line on the gauge 70 mm from the tip as shown in the figure below.

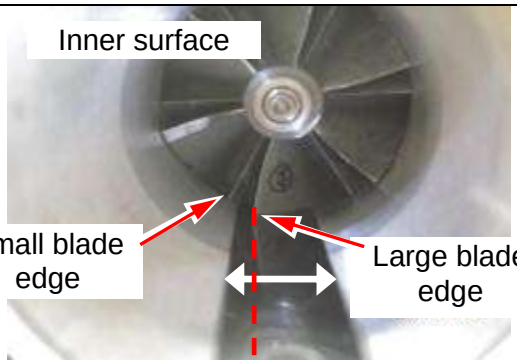
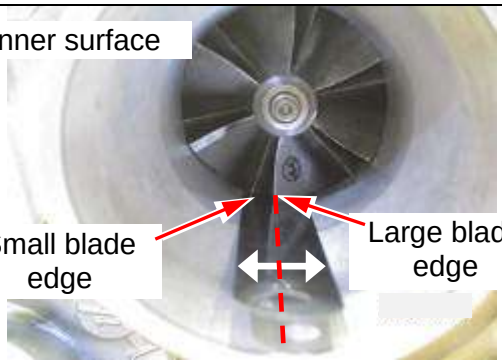


Use adhesive tape if it is hard to draw a permanent line on the gauge.

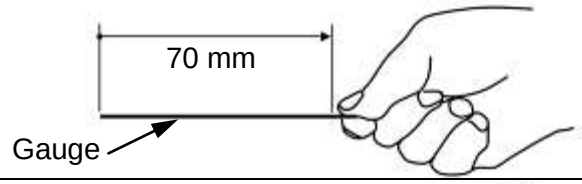
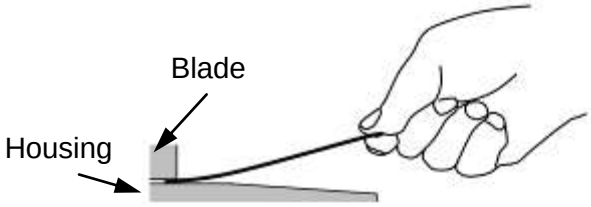
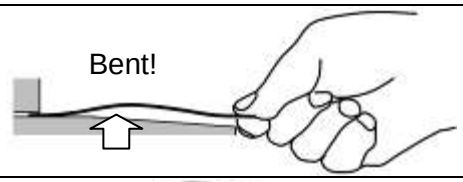
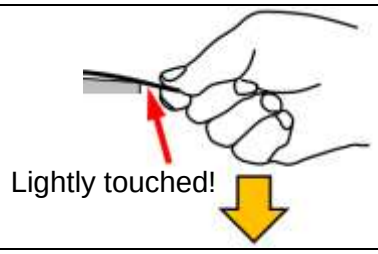


2. Rotate the turbocharger several times by pushing the blades manually to relieve the remaining engine oil pressure in the lubrication system.

3. Insert the prepared thickness gauge between the inner surface of the housing and the large blade edge positioned downside of the housing, and check whether or not the gauge is inserted 70 mm or more from the housing end. Repeatedly do the same for another three large blades each with its position facing downside. If the result at four blades is “OK”, there is no risk that turbocharger is NG. No need to check another two blades.

Correct positioning	Incorrect positioning
	
The large blade edge is offset from the center of the gauge, preventing the gauge from interfering with the small blade edge.	The large blade edge is positioned in the center of the gauge. The small blade edge prevents the gauge from being inserted correctly.

NOTE: Use the gauge appropriately as described in the table below.

	Hold the gauge 70 mm or more from the tip of the gauge.
	When the tip of the gauge contacts the edge of the blade, keep a certain angle to allow the tip to be inserted.
	Never apply excessive forces. When the gauge is bent, stop applying force, and check whether or not the gauge is inserted 70 mm or more.
	When judging, hold the gauge so that it lightly touches to the edge of the housing.

JUDGMENT:

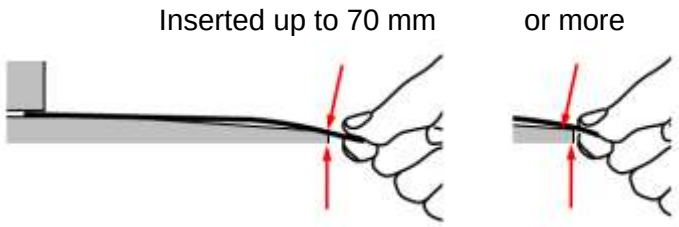
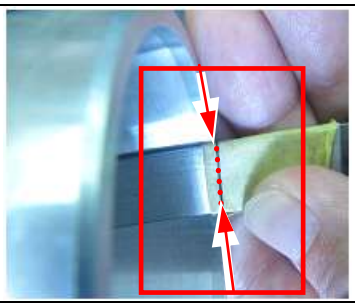
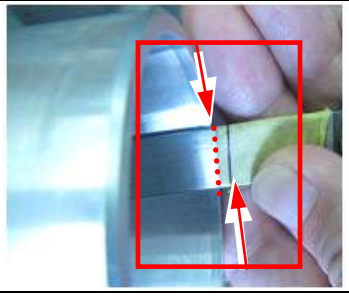
If the thickness gauge can be inserted up to the point at which the line mark aligns with the edge surface of the housing for one or more blades, or exceeds it:

➔ **The turbocharger is NG. Go to STEP 3.**

If the thickness gauge can NOT be inserted up to the point at which the line mark aligns with the edge surface of the housing for all blades:

➔ **The turbocharger is OK. If the vacuum pump is NG according to the inspection result from STEP 1, go to STEP 3.**

➔ **If both the turbocharger and vacuum pump are OK, this Service Information is not applicable. Refer to Workshop Manual for diagnosis.**

NG		
OK		

NOTE: If it is hard to judge by inserting the gauge, visually check the housing inside wall, where the turbine blades are located, for scratch marks by using an inspection mirror.

	NG: Scratches	**OK**: No scratches
 **Visual inspection on the inside wall of housing**	 Scratches causing the housing to be whitish	 No scratches on the housing wall

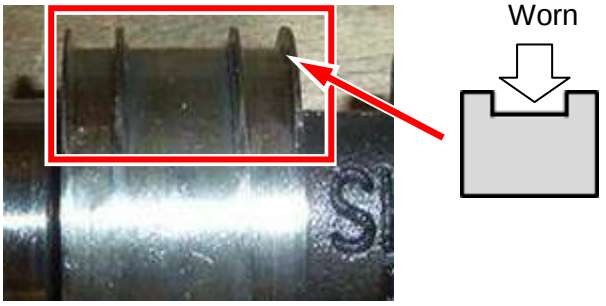
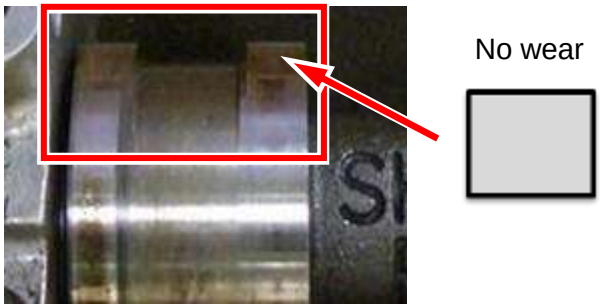
NOTE: If engine oil leakage from and/or around intercooler or turbocharger was found, repair the oil leakage before proceeding.

STEP 3: Flushing the engine with engine oil

1. Warm up the engine and, using M-MDS “ARPMDES” PID, keep the engine rpm at 2,000 rpm for 3 min.
2. Stop the engine, drain the original engine oil but do not discard the gasket. Reuse the removed gasket for the flushing procedure. Fill the engine with the flushing oil detailed in the parts information section.
3. Start the engine and, using M-MDS “ARPMDES” PID, keep the engine rpm at 2,000 rpm for 3 min.
4. Stop the engine and drain the flushing oil. Use a new gasket, replace the oil filter with a new one, and fill the engine with new engine oil.
5. Go to STEP 4.

STEP 4: Exhaust Camshaft Inspection

1. Remove the cylinder head cover, and check the high lift cams of the exhaust camshaft for wear.

NG: Worn	**OK**: Normal
	

JUDGMENT:
If the high lift cam on the exhaust camshaft is worn:
➔ **The exhaust camshaft is NG. Go to STEP 5.**
If no wear is found:
➔ **The exhaust camshaft is OK, i.e. this Service Information is not applicable. Refer to Workshop Manual for diagnosis.**

STEP 5: Parts replacement

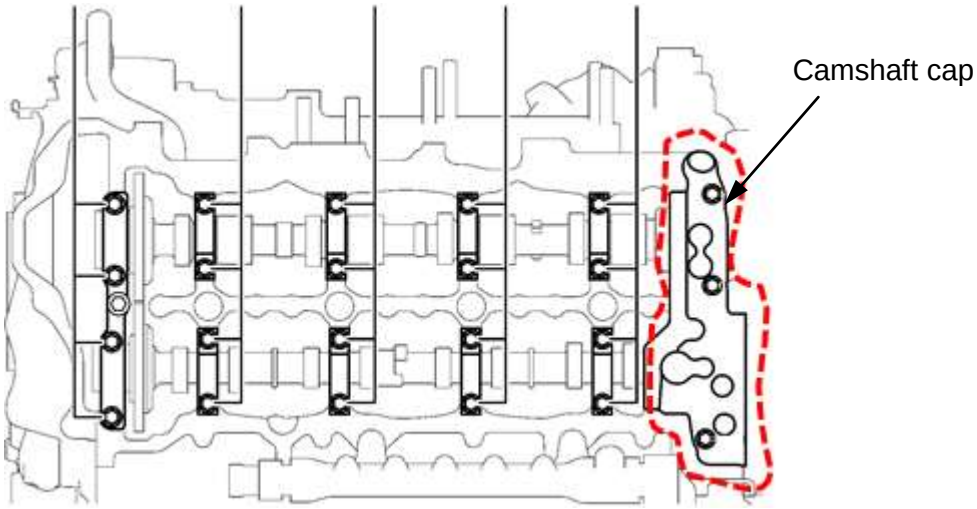
1. According to the inspection result of previous STEPs replace the parts that were found NG condition. For selection of the required kits refer to the table below:

		Judgment result		
		STEP 1 & 4 NG	STEP 2 & 4 NG	STEP 1 & 2 & 4 NG
Parts to be replaced	Vacuum pump	**X**		**X**
	Turbocharger		**X**	**X**
	Ex. Camshaft & Rocker arms	**X**	**X**	**X**
		⬇	⬇	⬇
Kits required	Kit A	**X**	**X**	**X**
	Kit B	**X**	**X**	**X**
	Kit C		**X**	**X**
	Kit D	**X**		**X**

2. Perform oil data reset
3. Perform DPF regeneration.
4. Only if the turbocharger has been replaced: Perform turbocharger initialization.

NOTE: When replacing exhaust camshaft and rocker arms, refer to SH Exhaust Camshaft Removal/ Installation procedure in the attachment on page 9.

CAUTION: Do not remove the camshaft cap at the engine rear side. If removed, the O-rings must be replaced with new ones, and adhesive sealant must be applied to the contact surface.
The Workshop Manual will be revised at a later date.



End of repair procedure

PARTS INFORMATION

Part Number	Part Name	Q'ty	Remark
SHY3-10-YG0	Kit A	1	Referring to the table in STEP 5 on page 7, order the correct combination of kits.
SHY2-10-YA0	Kit B	1	
SHY1-13-70Z	Kit C	1	
SHY2-18-W00	Kit D	1	
FLUS-05-OIL	FLUSHING OIL	1	Engine flushing (5 Liter)
Local procurement *	FLUSHING OIL	5	Liter ; 5W30
SH01-14-302A	Oil filter	1	-
99564-1400	Gasket	1	-
Local procurement	Engine oil	5.1	Liter

* valid for MMR only

BEGINNING VIN & DATE OF MODIFICATION

Mazda3:
EC Spec: JMZBM**** ** 112007 September 17, 2013
Mazda6:
EC Spec: JMZGJ**** ** 148781 September 17, 2013
ADR Spec: JM0GJ**** ** 122521 September 17, 2013
CX-5:
EC Spec: JMZKE**** ** 248119 September 17, 2013
UK Spec: JMZKE**** ** 163230 September 17, 2013
ADR Spec: JM0KE**** ** 224059 September 17, 2013

For reference only:
The beginning engine no. of the modification is as following:
Mazda3 (BM) and Mazda6 (GJ): SH3-0352618
CX-5 (KE): SH3-0352072
Service part (replacement engine): From SH3-0352618

WARRANTY INFORMATION

Symptom Code		36
Damage Code		9C
Causal Part No.		7777SPJ62
Q'ty		0
Operation No. & Labor Hours	Vacuum pump, Camshaft, rocker arms replacement & flushing	**XXKAAARX:** 4.7 Hrs
	Turbo charger, Camshaft, rocker arms replacement & flushing *	**XXKAABRX:** Mazda3: 7.8 Hrs CX-5 2WD: 8.0 Hrs CX-5 4WD: 9.3 Hrs Mazda6: 7.8 Hrs
	Vacuum pump, Turbo charger, Camshaft, rocker arms replacement & flushing *	**XXKAACRX:** Mazda3: 8.3 Hrs CX-5 2WD: 8.5 Hrs CX-5 4WD: 9.7 Hrs Mazda6: 8.3 Hrs
Period Covered		Normal Warranty Period
Prior Approval necessary		YES

*: In case of turbocharger replacement add the wheel alignment time (Operation No.: A0109XAX [for CX-5 and Mazda6]; A0109AAX [for Mazda3]: 1.1 Hrs using 4-wheel alignment tester). If the wheel alignment is performed by an external repair shop, submit the invoice as a sublet.

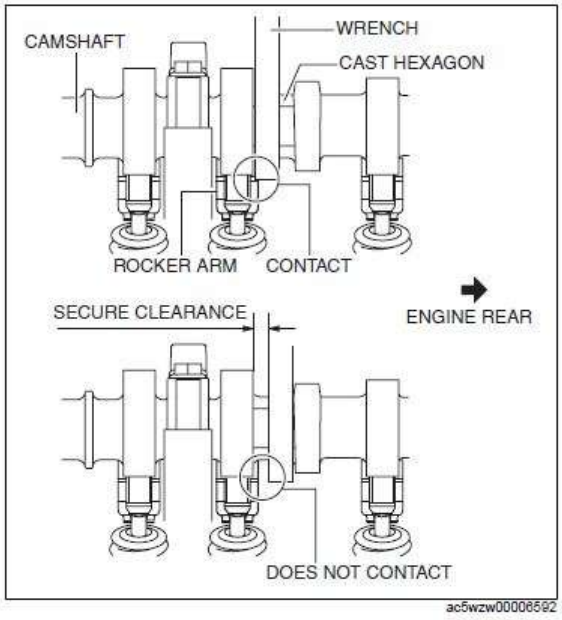
Ryu Shimizugawa
Manager, Technical Information Gr.
Technical Service Dept.
Mazda Motor Corporation

Attachment: SH Exhaust Camshaft Removal/ Installation

The below Exhaust Camshaft Removal/ Installation procedure is somewhat different from the Hydraulic Lash Adjuster Removal/ Installation procedure described in the Workshop Manual, i.e. some steps listed under Hydraulic Lash Adjuster Removal/ Installation are unnecessary when removing only the exhaust camshaft (e.g. there is no need to remove supply pump, CMP sensor, rear camshaft cap, intake camshaft). However, all of the Workshop Manual references listed in the below procedure can be found in MESI under HYDRAULIC LASH ADJUSTER (HLA) REMOVAL/INSTALLATION [SKYACTIV-D 2.2].

WARNING: A hot engine can cause severe burns. Turn off the engine and wait until it is cool before servicing.

CAUTION: When rotating the camshaft using a wrench on the cast hexagon, the wrench may contact the rocker arm and damage the rocker arm. To prevent damage to the rocker arm when holding the camshaft on the cast hexagon, use a wrench on the rear side of the engine as shown in the figure to secure a clearance between the cam.



1. Disconnect the negative battery cable. (See NEGATIVE BATTERY CABLE DISCONNECTION/ CONNECTION [SKYACTIV-D 2.2].)
2. Remove the engine cover. (See ENGINE COVER REMOVAL/INSTALLATION [SKYACTIV-D 2.2].)
3. Remove the fuel injectors. (See FUEL INJECTOR REMOVAL/INSTALLATION [SKYACTIV-D 2.2].)

4. Remove the lower case. (See LOWER CASE REMOVAL/INSTALLATION [SKYACTIV-D 2.2].)
5. Only if the vacuum pump was found NG condition: Remove the vacuum pump. (See VACUUM PUMP REMOVAL/INSTALLATION [SKYACTIV-D 2.2].)
6. Remove the cylinder head cover. (See TIMING CHAIN REMOVAL/INSTALLATION [SKYACTIV-D 2.2].)
7. Remove the splash shield. (See SPLASH SHIELD REMOVAL/INSTALLATION.)
8. Remove the oil shower pipe.
9. Remove the noise suppression cover no.1 and the seal rubber (if equipped) (See HYDRAULIC LASH ADJUSTER (HLA) REMOVAL/INSTALLATION [SKYACTIV-D 2.2], Noise Suppression Cover (No.1), Seal Rubber Removal Note.)
10. Set the timing chain aside from the exhaust camshaft (See HYDRAULIC LASH ADJUSTER (HLA) REMOVAL/INSTALLATION [SKYACTIV-D 2.2], Timing Chain Removal Note.)

NOTE: For explanation purposes the timing chain cover is removed on some of the pictures shown in the Timing Chain Removal procedure. However, for exhaust camshaft removal it is not necessary to remove the timing chain cover.

11. Remove the exhaust camshaft (see Exhaust Camshaft Removal Note on page 11)
12. Replace the IDEVA rocker arms (See HYDRAULIC LASH ADJUSTER (HLA) REMOVAL/INSTALLATION [SKYACTIV-D 2.2], Rocker Arm Installation Note.)
13. Install the new exhaust camshaft (see Exhaust Camshaft Installation Note on page 13)
14. Install the remaining parts in the reverse order of removal.

NOTE: Make sure to follow the below service points during installation of timing chain and fuel injectors.

Service Point 1: Exhaust camshaft sprocket fixing bolt tightening

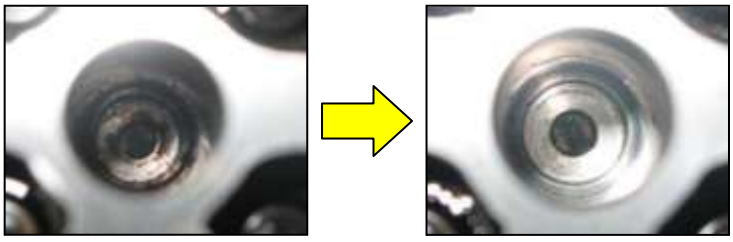
Thin head type torque wrench is recommended in SI MME/T001/14.

－**Too low tightening torque results in engine damage.**

Service Point 2: Fuel injector bore cleaning

The cleaning procedure is announced by SI MME/E004/12, and the cleaning kit is introduced by SI MME/T005/12.

- **Improper cleaning results in combustion gas leakage.**

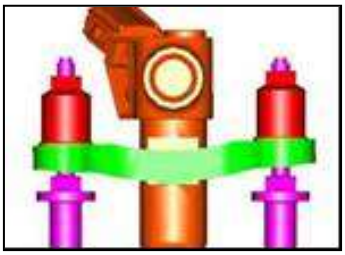


Before　　After

Service Point 3: Fuel injector tightening

Follow the modified tightening procedure which is announced by SI E003/14B.

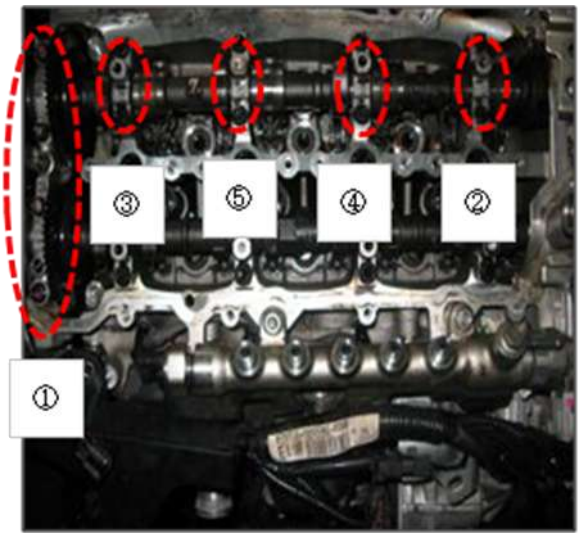
- **If the injector clamping force is too low, this will result in combustion gas leakage.**
- **If the injector clamping force is too high, the injector operation is impaired due to deformation of the nozzle body.**



Exhaust Camshaft Removal Note

1. Loosen the exhaust camshaft cap bolts in two or three passes in the order shown in the figure, and remove the exhaust camshaft caps.

CAUTION: Do not remove the camshaft cap at the engine rear side. If removed, the O-rings must be replaced with new ones, and adhesive sealant must be applied to the contact surface.



2. Turn the exhaust camshaft until the groove driving the supply pump is in the position shown in below picture (piston no.1 in TDC position).

3. Hold the exhaust camshaft on the front side (sprocket side) and slightly lift the front part of the camshaft.

4. Turn the exhaust camshaft clockwise until the groove driving the supply pump is in the horizontal position.

5. Pull the exhaust camshaft out from the supply pump connection and remove it from the cylinder head.

Make sure that the cam lobes do not touch the cylinder head journals during removal.

Exhaust Camshaft Installation Note

1. Apply gear oil (SAE No. 90 or equivalent) or engine oil to the following locations.
   • Each journal of the cylinder head
   • Needle roller bearing and slipper area of the rocker arm

2. Apply gear oil (SAE 90 or equivalent) or engine oil to the following locations of each camshaft.
   • Gear sliding surfaces
   • Thrust surface of front journal

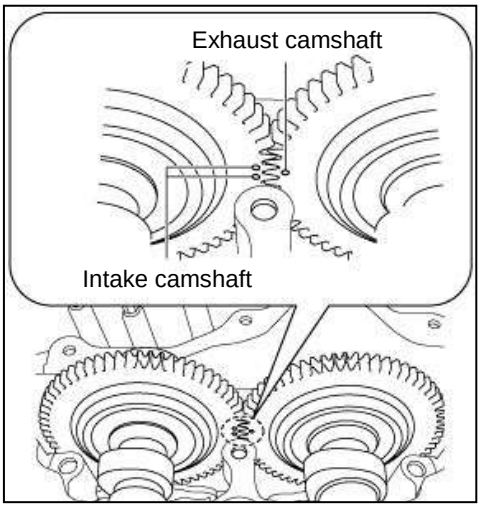
Note: If oil is applied to the front camshaft cap, oil should not be applied to the thrust surface of the front journal.

3. Position the supply pump connection as shown in below picture.

4. Hold the exhaust camshaft on the front side (sprocket side) and insert it into the supply pump connection.

5. Turn the exhaust camshaft clockwise until there is no more interference between cam lobes and cylinder head journals, and then place it on the cylinder head.

6. Align the aligment mark of the exhaust camshaft with that of the intake camshaft.



7. As shown in the figure, apply gear oil (SAE No. 90 or equivalent) or engine oil to the center area of each journal of the camshaft.

8. Apply gear oil (SAE 90 or equivalent) or engine oil to the thrust surface of the front camshaft cap.

Note: If oil is applied to the front journal thrust surface of each camshaft, oil should not be applied to the front camshaft cap.

9. Install the camshaft caps in the marked number order, and temporarily tighten the camshaft cap installation bolts in two or three passes evenly.
10. Tighten the camshaft cap installation bolts in two steps in the order shown in the figure.