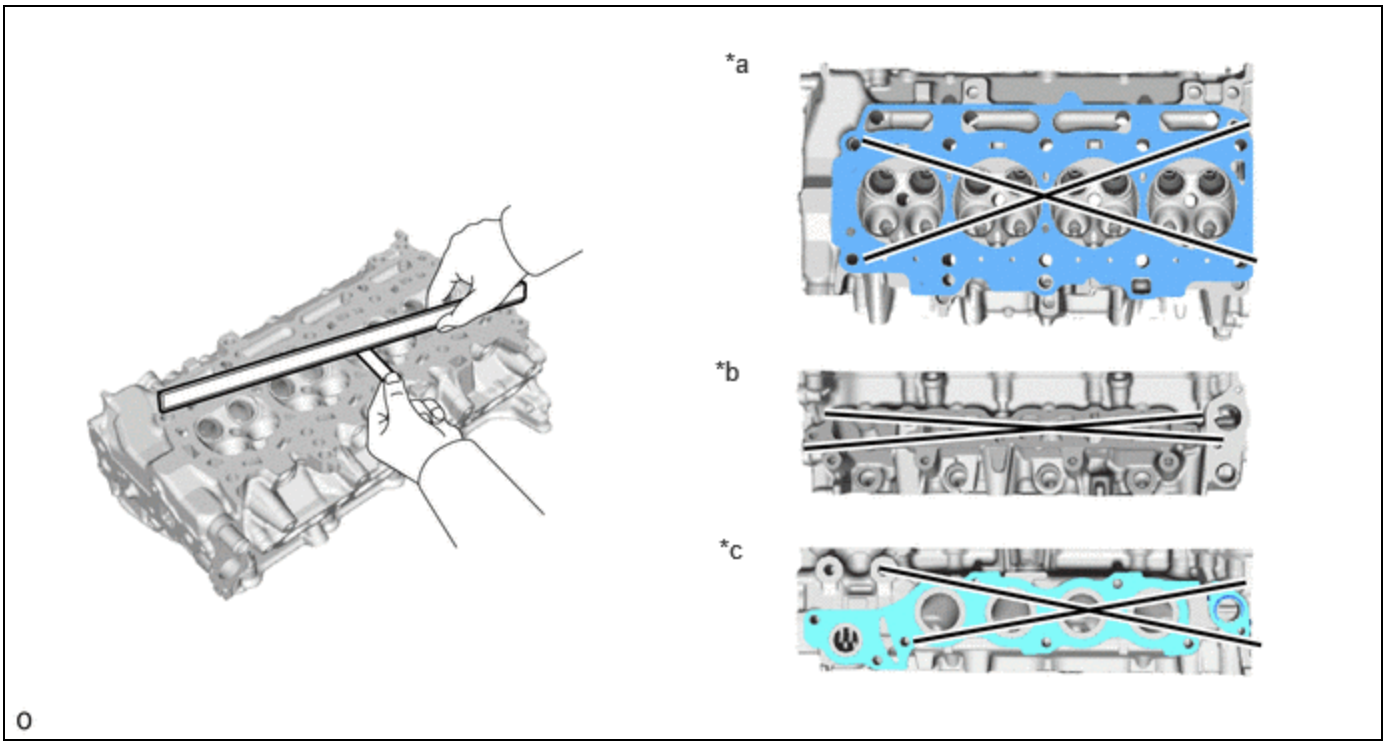
Last Modified: 12-04-2024	6.11:8.1.0	**Doc ID:** RM100000002C1X4
Model Year Start: 2023	**Model:** Prius Prime	**Prod Date Range:** [03/2023 -]
Title: M20A-FXS (ENGINE MECHANICAL): CYLINDER HEAD: INSPECTION; 2023 - 2024 MY Prius Prius Prime [03/2023 -]		

INSPECTION

PROCEDURE

1. INSPECT CYLINDER HEAD SUB-ASSEMBLY

(a) Using a precision straightedge and feeler gauge, measure the warpage of the contact surfaces where the cylinder head sub-assembly contacts the cylinder block sub-assembly, intake manifold and exhaust manifold.



*a	Bottom Side	*b	Intake Manifold Side
*c	Exhaust Manifold Side	-	-

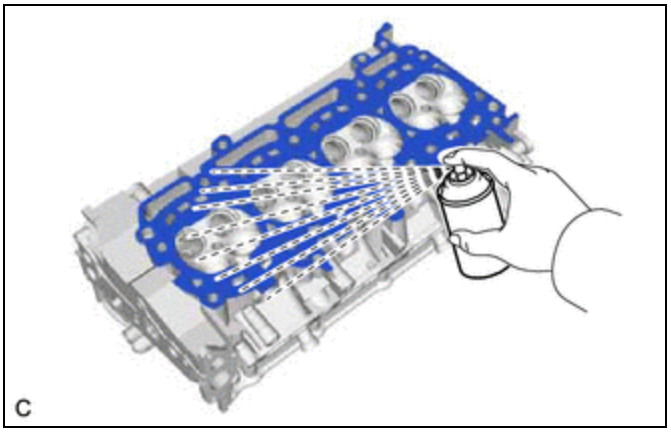
Maximum Warpage:

ITEM	SPECIFIED CONDITION	RESULT
Bottom side	0.05 mm 0.00197 in.	mm in.
Intake manifold side	0.10 mm 0.00394 in.	mm in.
Exhaust manifold side	0.10 mm 0.00394 in.	mm in.

(b) If the warpage is more than the maximum, replace the cylinder head sub-assembly.

(c) Using a dye penetrant, check the intake ports, exhaust ports and cylinder head sub-assembly

surface for cracks.



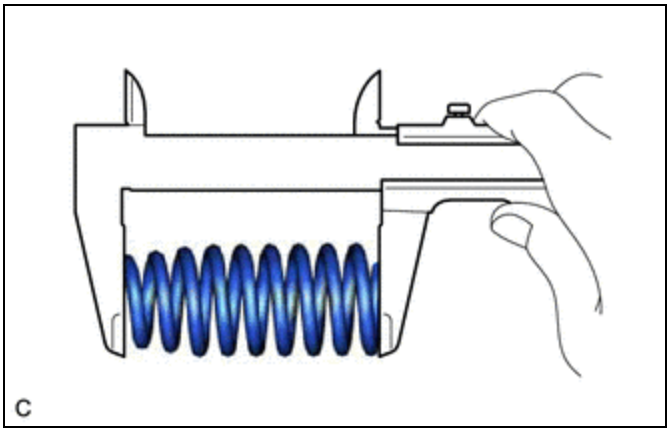
(d) If cracks are found, replace the cylinder head sub-assembly.

2. INSPECT INTAKE VALVE COMPRESSION SPRING

(a) Using a vernier caliper, measure the free length of the intake valve compression spring.

Standard Free Length:

SPECIFIED CONDITION	RESULT
58.81 mm 2.32 in.	mm in.

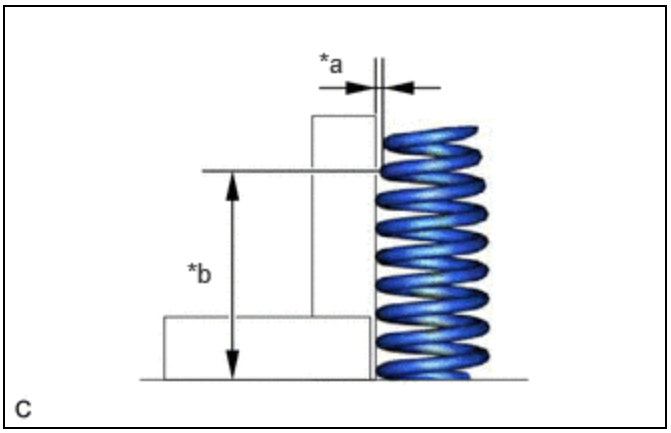


(b) If the free length is not as specified, replace the intake valve compression spring.

(c) Using a steel square, measure the deviation of the intake valve compression spring.

Maximum Deviation (Reference):

SPECIFIED CONDITION	RESULT
1.0 mm 0.0394 in.	mm in.



*a	Deviation
*b	37 mm (1.46 in.)

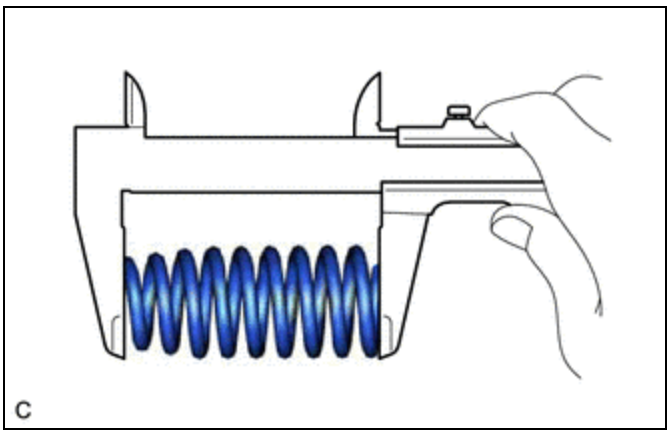
(d) If the deviation is more than the maximum, replace the intake valve compression spring.

3. INSPECT EXHAUST VALVE COMPRESSION SPRING

(a) Using a vernier caliper, measure the free length of the exhaust valve compression spring.

Standard Free Length:

SPECIFIED CONDITION	RESULT
58.81 mm 2.32 in.	mm in.

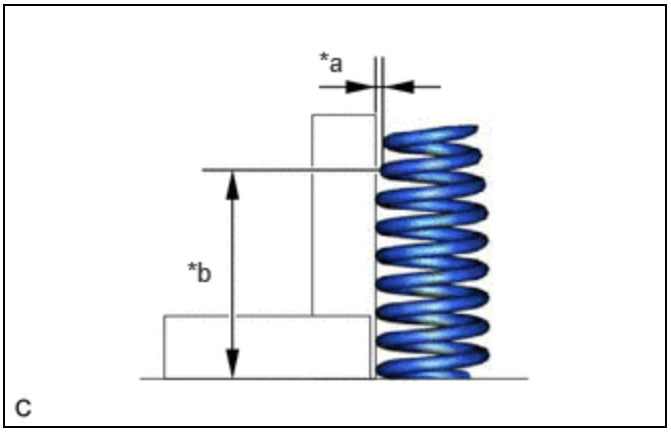


(b) If the free length is not as specified, replace the exhaust valve compression spring.

(c) Using a steel square, measure the deviation of the exhaust valve compression spring.

Maximum Deviation (Reference):

SPECIFIED CONDITION	RESULT
1.0 mm 0.0394 in.	mm in.



*a	Deviation
*b	37 mm (1.46 in.)

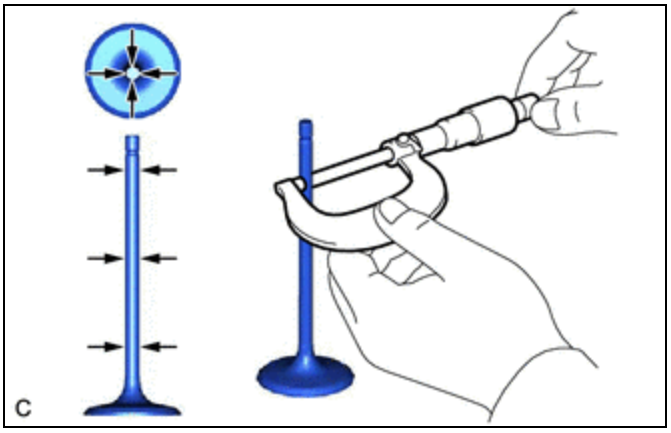
(d) If the deviation is more than the maximum, replace the exhaust valve compression spring.

4. INSPECT INTAKE VALVE

(a) Using a micrometer, measure the diameter of the intake valve stem.

Standard Valve Stem Diameter:

SPECIFIED CONDITION	RESULT
5.470 to 5.485 mm 0.215 to 0.216 in.	mm in.

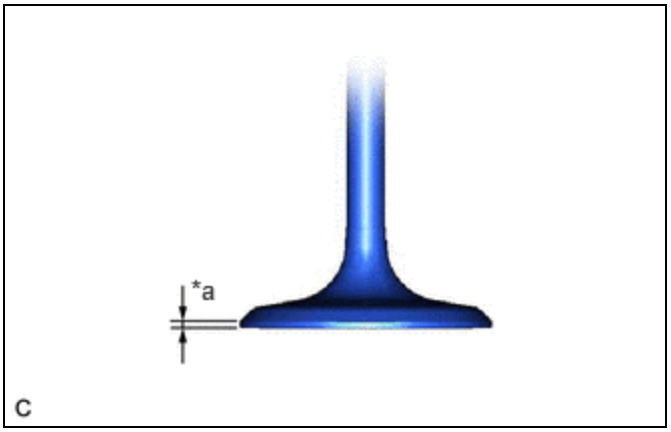


(b) If the intake valve stem diameter is not as specified, check the intake valve guide bush oil clearance.

(c) Using a vernier caliper, measure the intake valve head margin thickness.

Standard Margin Thickness:

MINIMUM MARGIN THICKNESS	SPECIFIED CONDITION	RESULT
0.5 mm 0.0197 in.	1.0 mm 0.0394 in.	mm in.



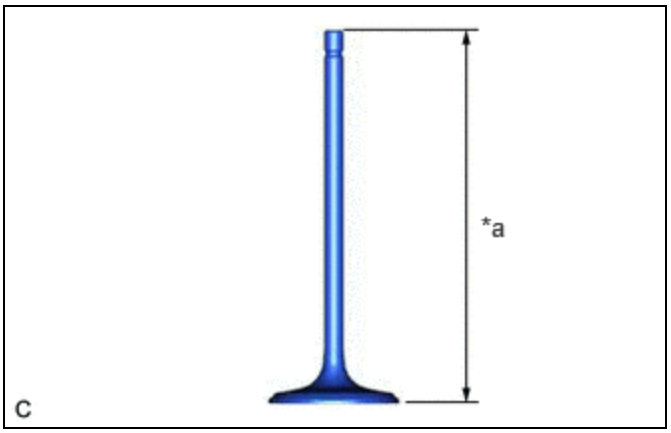
*a	Margin Thickness

(d) If the margin thickness is less than the minimum, replace the intake valve.

(e) Using a vernier caliper, measure the overall length of the intake valve.

Standard Overall Length:

MINIMUM OVERALL LENGTH	SPECIFIED CONDITION	RESULT
101.95 mm 4.01 in.	102.45 mm 4.03 in.	mm in.



*a	Overall Length

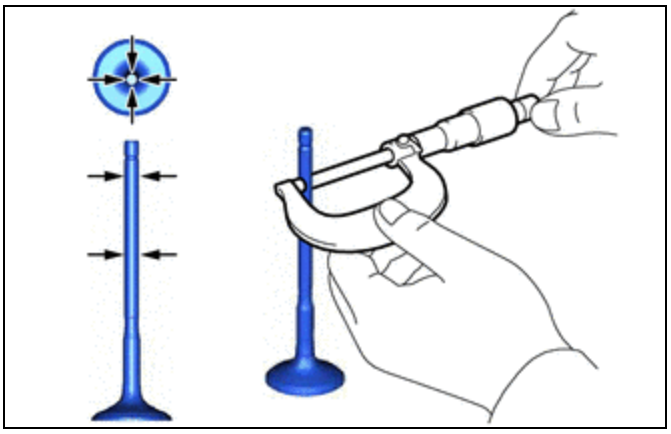
(f) If the overall length is less than the minimum, replace the intake valve.

5. INSPECT EXHAUST VALVE

(a) Using a micrometer, measure the diameter of the exhaust valve stem.

Standard Valve Stem Diameter:

SPECIFIED CONDITION	RESULT
5.465 to 5.480 mm 0.215 to 0.216 in.	mm in.

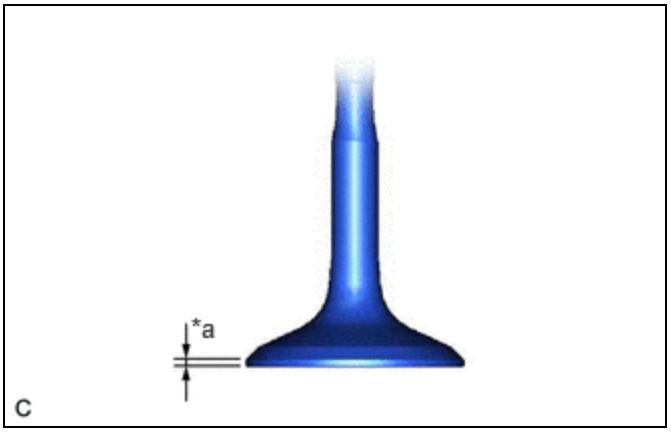


(b) If the exhaust valve stem diameter is not as specified, check the exhaust valve guide bush oil clearance.

(c) Using a vernier caliper, measure the exhaust valve head margin thickness.

Standard Margin Thickness:

MINIMUM MARGIN THICKNESS	SPECIFIED CONDITION	RESULT
0.5 mm 0.0197 in.	1.0 mm 0.0394 in.	mm in.



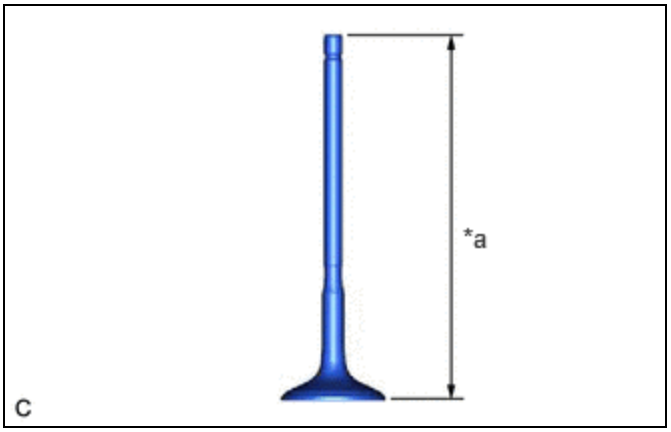
*a	Margin Thickness

(d) If the margin thickness is less than the minimum, replace the exhaust valve.

(e) Using a vernier caliper, measure the overall length of the exhaust valve.

Standard Overall Length:

MINIMUM OVERALL LENGTH	SPECIFIED CONDITION	RESULT
105.9 mm 4.17 in.	106.4 mm 4.19 in.	mm in.



*a	Overall Length

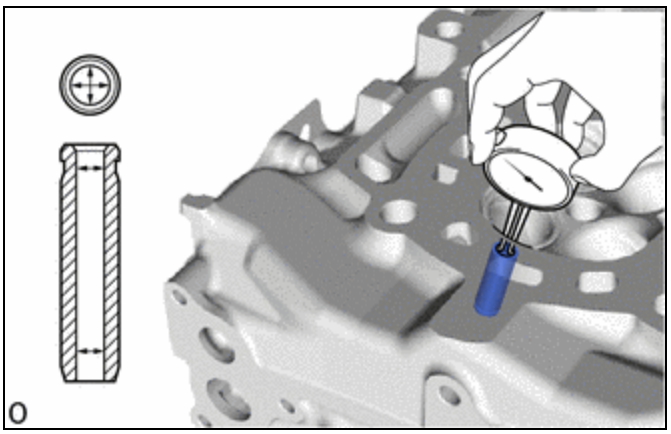
(f) If the overall length is less than the minimum, replace the exhaust valve.

6. INSPECT VALVE GUIDE BUSH OIL CLEARANCE

(a) Using a caliper gauge, measure the inside diameter of the valve guide bush.

Standard Valve Guide Bush Inside Diameter:

SPECIFIED CONDITION	RESULT
5.51 to 5.53 mm 0.217 to 0.218 in.	mm in.



(b) Subtract the valve stem diameter measurement from the valve guide bush inside diameter measurement.

Standard Oil Clearance:

ITEM	MAXIMUM OIL CLEARANCE	SPECIFIED CONDITION	RESULT
Intake Side	0.080 mm 0.00315 in.	0.025 to 0.060 mm 0.000984 to 0.00236 in.	mm in.
Exhaust Side	0.10 mm 0.00394 in.	0.030 to 0.065 mm 0.00118 to 0.00256 in.	mm in.

HINT:

Oil clearance = Valve guide bush inside diameter - Valve stem diameter

(c) If the oil clearance is more than the maximum, replace the valve and valve guide bush.

7. INSPECT INTAKE VALVE SEAT

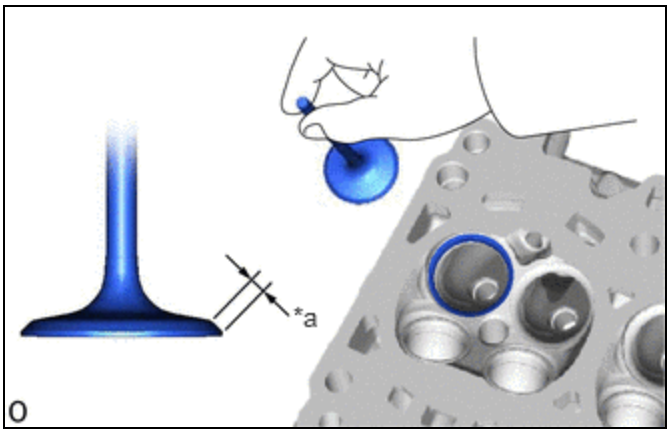
Pre-procedure1

(a) Apply a light coat of Prussian blue to the valve face.

(b) Lightly press the valve face against the intake valve seat.

NOTICE:

Do not rotate the valve while pressing it.



*a	Width

Procedure1

(c) Check the valve face and intake valve seat by using the following procedure:

(1) If Prussian blue appears 360° around the entire intake valve face, the valve face is concentric.

(2) If the valve face is not concentric, replace the intake valve.

(3) If Prussian blue appears 360° around the entire intake valve seat, the intake valve seat and valve face are concentric.

(4) If the valve face is not concentric, replace the cylinder head sub-assembly.

(5) Measure the width of the contact area of the intake valve seat and valve face.

Standard Width:

SPECIFIED CONDITION	RESULT
1.0 to 1.4 mm 0.0394 to 0.0551 in.	mm in.

Post-procedure1

(d) None

8. INSPECT EXHAUST VALVE SEAT

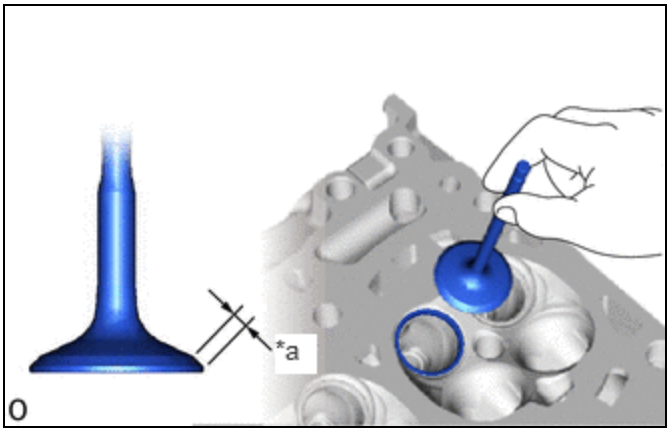
Pre-procedure1

(a) Apply a light coat of Prussian blue to the valve face.

(b) Lightly press the valve face against the exhaust valve seat.

NOTICE:

Do not rotate the valve while pressing it.



*a	Width

Procedure1

(c) Check the valve face and exhaust valve seat by using the following procedure:

(1) If Prussian blue appears 360° around the entire exhaust valve face, the valve face is concentric.

(2) If the valve face is not concentric, replace the exhaust valve.

(3) If Prussian blue appears 360° around the entire exhaust valve seat, the exhaust valve seat and valve face are concentric.

(4) If the valve face is not concentric, resurface the exhaust valve seat.

(5) Measure the width of the contact area of the exhaust valve seat and valve face.

Standard Width:

SPECIFIED CONDITION	RESULT
1.2 to 1.6 mm 0.0472 to 0.0630 in.	mm in.

Post-procedure1

(d) None

9. INSPECT CAMSHAFT THRUST CLEARANCE

Pre-procedure1

(a) Clean the No. 1 camshaft bearing cap, No. 2 camshaft bearing cap, 2 No. 3 camshaft bearing caps, No. 4 camshaft bearing cap, camshaft housing sub-assembly and camshaft journals.

(b) Place the intake camshaft sub-assembly and exhaust camshaft sub-assembly on the camshaft housing sub-assembly on the cylinder head sub-assembly.

(c) Install the camshaft bearing caps.

HINT:

- for HEV Model:

  Click here INFO
- for PHEV Model:

  Click here INFO

(d) Install the camshaft housing sub-assembly.

HINT:

- for HEV Model:

  Click here INFO
- for PHEV Model:

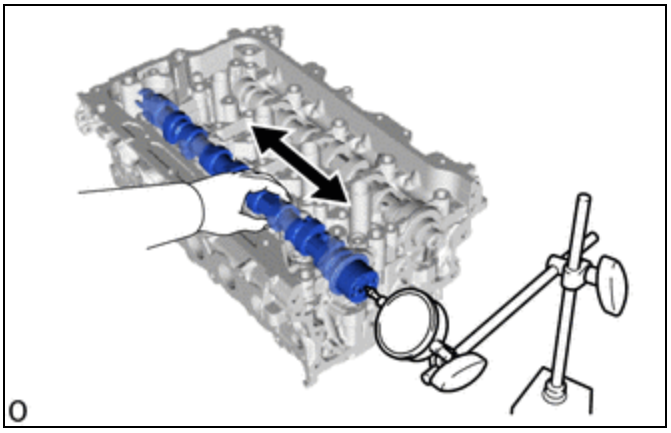
  Click here INFO

Procedure1

(e) Using a dial indicator, measure the thrust clearance while moving the intake camshaft sub-assembly and exhaust camshaft sub-assembly back and forth.

Standard Thrust Clearance:

ITEM	MAXIMUM THRUST CLEARANCE	SPECIFIED CONDITION	RESULT
Intake camshaft sub-assembly	0.22 mm 0.00866 in.	0.04 to 0.17 mm 0.00157 to 0.00669 in.	mm in.
Exhaust camshaft sub-assembly	0.22 mm 0.00866 in.	0.04 to 0.17 mm 0.00157 to 0.00669 in.	mm in.



(f) If the thrust clearance is more than the maximum, replace the camshaft housing sub-assembly. If the thrust surface is damaged, replace the intake camshaft sub-assembly or exhaust camshaft sub-assembly.

Post-procedure1

(g) None