

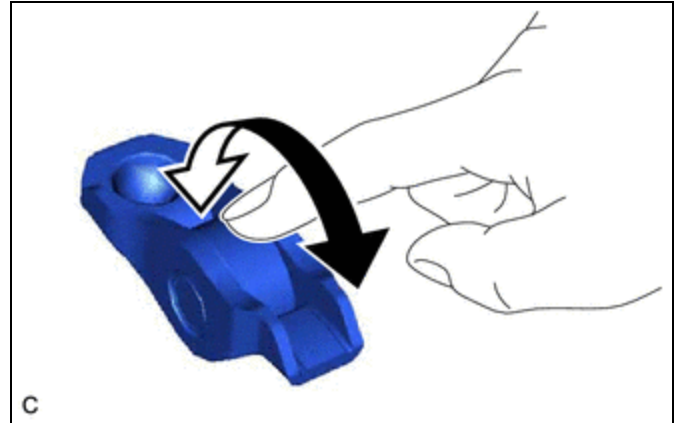
Last Modified: 12-04-2024	6.11:8.1.0	Doc ID: RM10000002AMRS
Model Year Start: 2023	Model: Prius Prime	Prod Date Range: [03/2023 -]
Title: M20A-FXS (ENGINE MECHANICAL): ENGINE UNIT (for PHEV Model): INSPECTION; 2023 - 2024 MY Prius Prime [03/2023 -]		

INSPECTION

PROCEDURE

1. INSPECT NO. 1 VALVE ROCKER ARM SUB-ASSEMBLY

- (a) Turn the roller by hand to check that it turns smoothly.



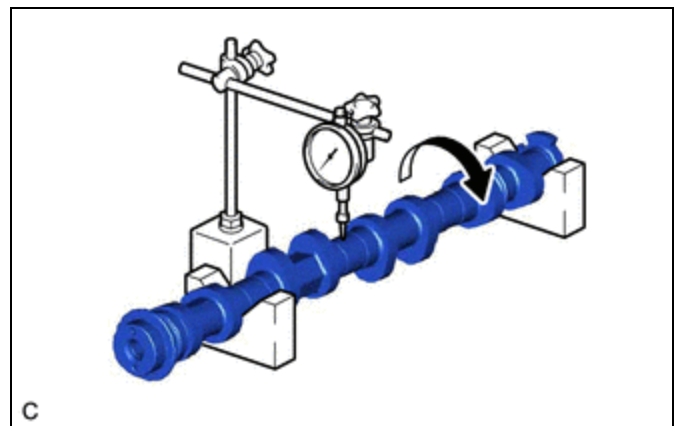
- (b) If the roller does not turn smoothly, replace the No. 1 valve rocker arm sub-assembly.

2. INSPECT INTAKE CAMSHAFT SUB-ASSEMBLY

- (a) Inspect the intake camshaft sub-assembly for runout.
 - (1) Place the intake camshaft sub-assembly on V-blocks.
 - (2) Using a dial indicator, measure the runout at the center journal.

Maximum Runout:

SPECIFIED CONDITION	RESULT
0.03 mm	mm
0.00118 in.	in.



- (3) If the runout is more than the maximum, replace the intake camshaft sub-assembly.

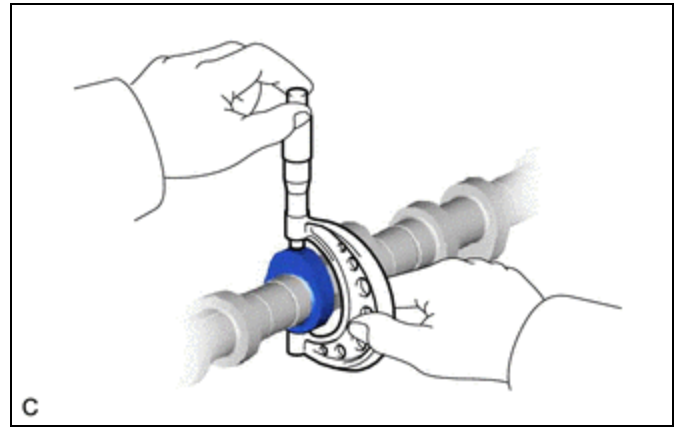
- (b) Inspect the cam lobes.

- (1) Using a micrometer, measure the cam lobe height.

Standard Cam Lobe Height:

MINIMUM CAM LOBE HEIGHT	SPECIFIED CONDITION	RESULT
42.157 mm 1.65972 in.	42.267 to 42.367 mm 1.66405 to 1.66799 in.	mm in.

(2) If the cam lobe height is less than the minimum, replace the intake camshaft sub-assembly.



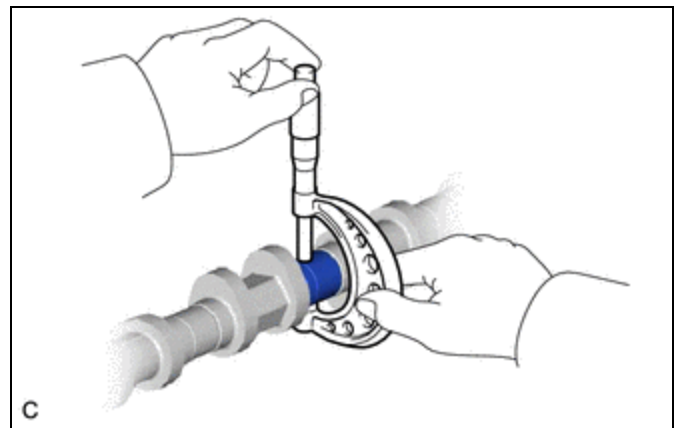
(c) Inspect the intake camshaft sub-assembly journals.

(1) Using a micrometer, measure the journal diameter.

Standard Journal Diameter:

ITEM	SPECIFIED CONDITION	RESULT
No. 1 journal	33.984 to 34.000 mm 1.33795 to 1.33858 in.	mm in.
Other journals	23.959 to 23.975 mm 0.94327 to 0.94390 in.	mm in.

(2) If the journal diameter is not as specified, check the camshaft oil clearance.



3. INSPECT EXHAUST CAMSHAFT SUB-ASSEMBLY

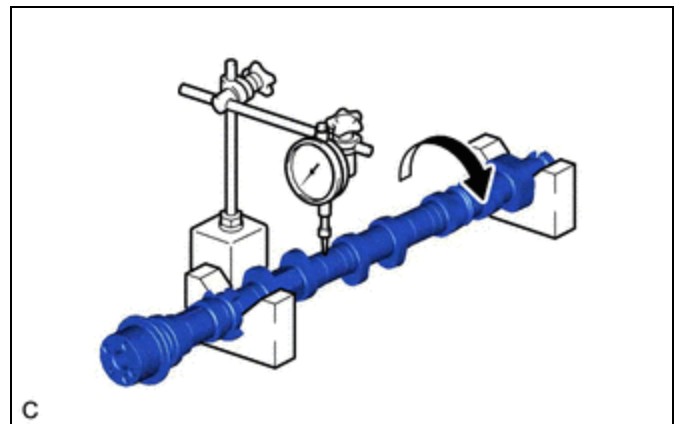
(a) Inspect the exhaust camshaft sub-assembly for runout.

- (1) Place the exhaust camshaft sub-assembly on V-blocks.
- (2) Using a dial indicator, measure the runout at the center journal.

Maximum Runout:

SPECIFIED CONDITION	RESULT
0.03 mm 0.00118 in.	mm in.

(3) If the runout is more than the maximum, replace the exhaust camshaft sub-assembly.

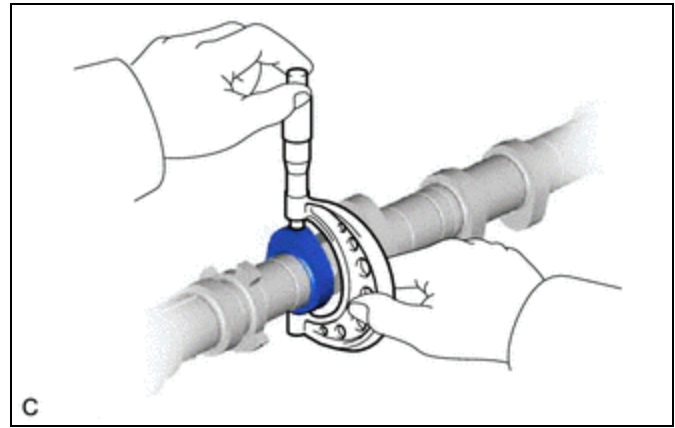


(b) Inspect the cam lobes.

(1) Using a micrometer, measure the cam lobe height.

Standard Cam Lobe Height:

ITEM	MINIMUM CAM LOBE HEIGHT	SPECIFIED CONDITION	RESULT
Exhaust camshaft sub-assembly	42.052 mm 1.65559 in.	42.162 to 42.262 mm 1.65992 to 1.66385 in.	mm in.
Exhaust camshaft sub-assembly (for Fuel Pump)	42.836 mm 1.68645 in.	42.946 to 43.046 mm 1.69078 to 1.69472 in.	mm in.



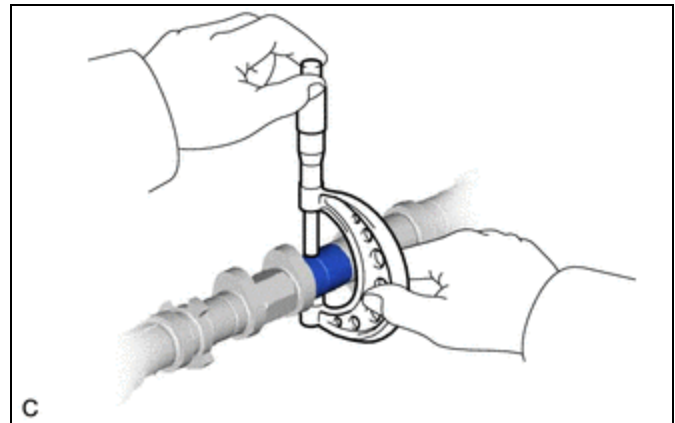
(2) If the cam lobe height is less than the minimum, replace the exhaust camshaft sub-assembly.

(c) Inspect the exhaust camshaft sub-assembly journals.

(1) Using a micrometer, measure the journal diameter.

Standard Journal Diameter:

ITEM	SPECIFIED CONDITION	RESULT
No. 1 journal	40.984 to 41.000 mm 1.61354 to 1.61417 in.	mm in.
Other journals	23.959 to 23.975 mm 0.94327 to 0.94390 in.	mm in.



(2) If the journal diameter is not as specified, check the camshaft oil clearance.

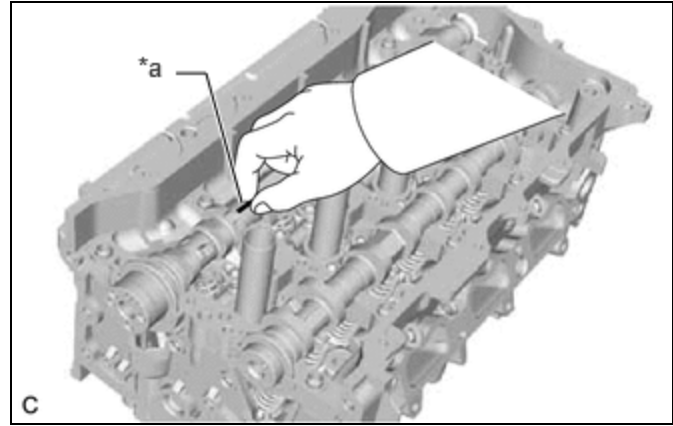
4. INSPECT CAMSHAFT OIL CLEARANCE

NOTICE:

Do not turn the camshafts.

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.
- (c) Lay a strip of Plastigage across each of the camshaft journals.



*a	Plastigage
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(d) Install the camshaft bearing caps.

HINT:

[Click here](#) INFO

(e) Install the camshaft housing sub-assembly.

HINT:

[Click here](#) INFO

(f) Remove the camshaft housing sub-assembly.

HINT:

[Click here](#) INFO

(g) Remove the camshaft bearing caps.

HINT:

[Click here](#) INFO

Procedure1

(h) Measure the Plastigage at its widest point.

Standard Oil Clearance (for Intake camshaft sub-assembly):

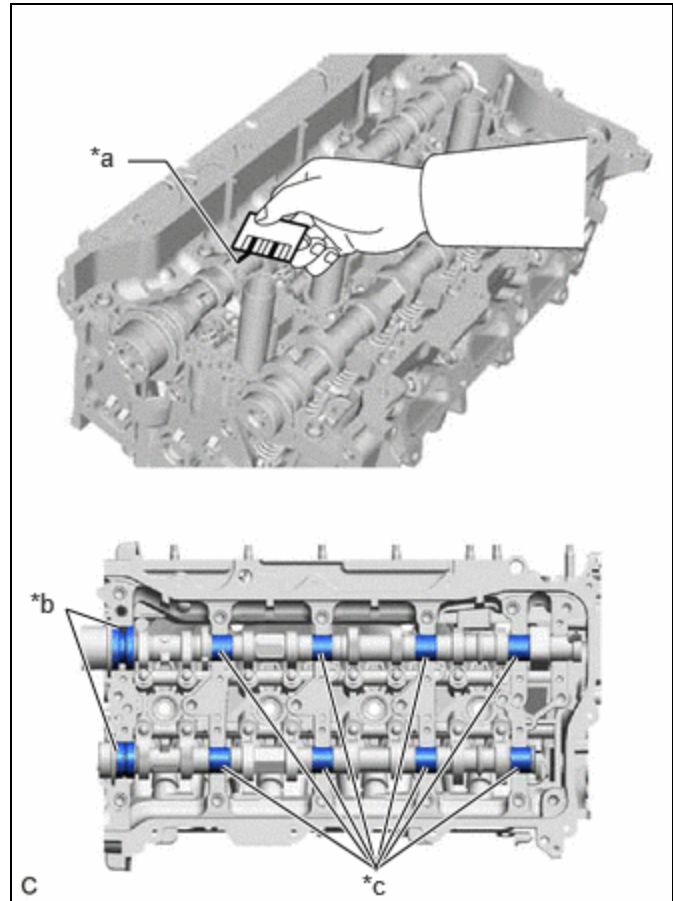
ITEM	MAXIMUM OIL CLEARANCE	SPECIFIED CONDITION	RESULT
No. 1 Journal	0.085 mm 0.00335 in.	0.035 to 0.072 mm 0.00138 to 0.00283 in.	mm in.
Other journals	0.085 mm 0.00335 in.	0.025 to 0.062 mm 0.000984 to 0.00244 in.	mm in.

Standard Oil Clearance (for Exhaust camshaft sub-assembly):

ITEM	MAXIMUM OIL CLEARANCE	SPECIFIED CONDITION	RESULT
No. 1 Journal	0.085 mm 0.00335 in.	0.027 to 0.064 mm 0.00106 to 0.00252 in.	mm in.
Other journals	0.085 mm 0.00335 in.	0.025 to 0.062 mm 0.000984 to 0.00244 in.	mm in.

NOTICE:

Completely remove the Plastigage after the inspection.



*a	Plastigage
*b	No. 1 Journal
*c	Other Journal

- (i) If the oil clearance is more than the maximum, replace the intake camshaft sub-assembly or exhaust camshaft sub-assembly. If necessary, replace the camshaft housing sub-assembly.

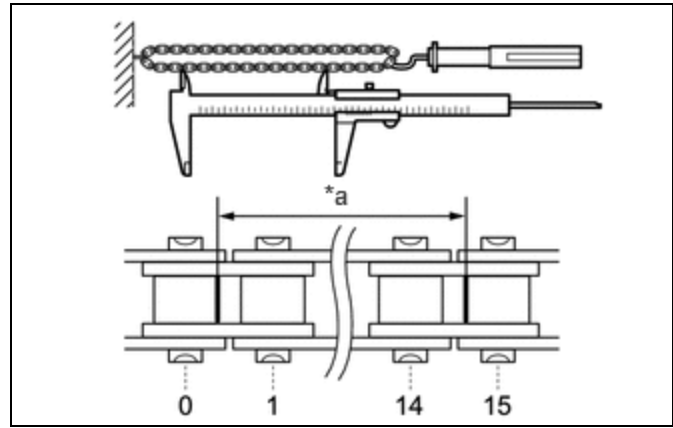
Post-procedure1

- (j) None

5. INSPECT CHAIN SUB-ASSEMBLY

Pre-procedure1

- (a) Using a spring scale, pull the chain sub-assembly with a force of 147 N (15 kgf, 33.0 lbf) as shown in the illustration.



*a	Measurement Length
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Procedure1

(b) Using a vernier caliper, measure the length of 15 links.

Maximum Chain Elongation:

SPECIFIED CONDITION	RESULT
116.30 mm	mm
4.58 in.	in.

HINT:

Perform the measurement at 3 random places. Use the average of the measurements.

(c) If the average elongation is more than the maximum, replace the chain sub-assembly.

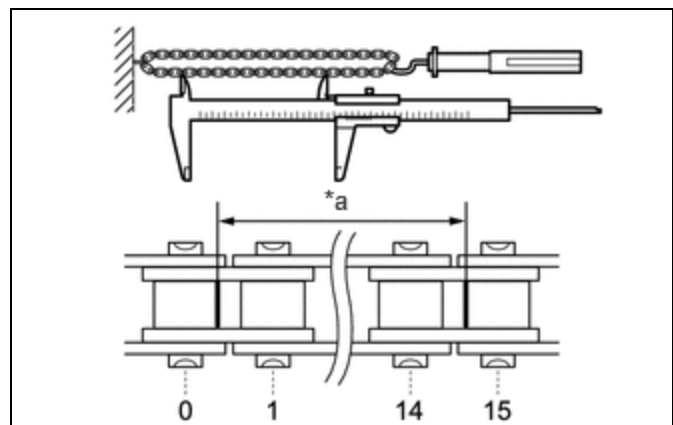
Post-procedure1

(d) None

6. INSPECT OIL PUMP DRIVE CHAIN SUB-ASSEMBLY

Pre-procedure1

(a) Using a spring scale, pull the oil pump drive chain sub-assembly with a force of 147 N (15 kgf, 33.0 lbf) as shown in the illustration.



*a	Measurement Length
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Procedure1

(b) Using a vernier caliper, measure the length of 15 links.

Maximum Chain Elongation:

SPECIFIED CONDITION	RESULT
116.30 mm	mm
4.58 in.	in.

HINT:

Perform the measurement at 3 random places. Use the average of the measurements.

(c) If the average elongation is more than the maximum, replace the oil pump drive chain sub-assembly.

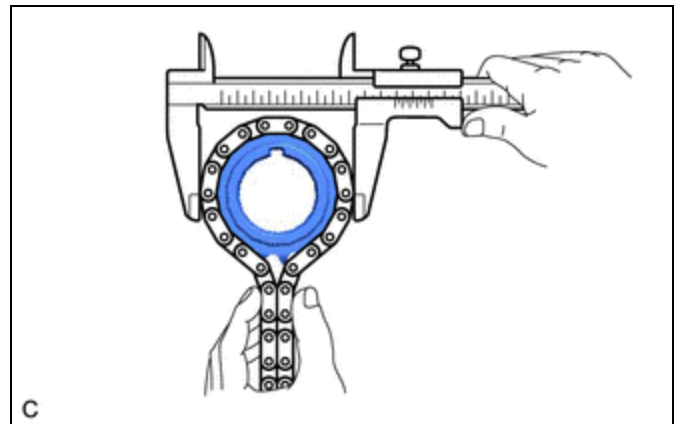
Post-procedure1

(d) None

7. INSPECT OIL PUMP DRIVE SPROCKET

Pre-procedure1

(a) Place the oil pump drive chain sub-assembly around the oil pump drive sprocket.



Procedure1

(b) Using a vernier caliper, measure the diameter of the oil pump drive sprocket and oil pump drive chain sub-assembly.

Minimum Sprocket Diameter (with Oil Pump Drive Chain Sub-assembly):

SPECIFIED CONDITION	RESULT
51.35 mm	mm
2.02 in.	in.

NOTICE:

The vernier caliper must be in contact with the chain rollers when measuring.

(c) If the diameter is less than the minimum, replace the oil pump drive chain sub-assembly and oil pump drive sprocket.

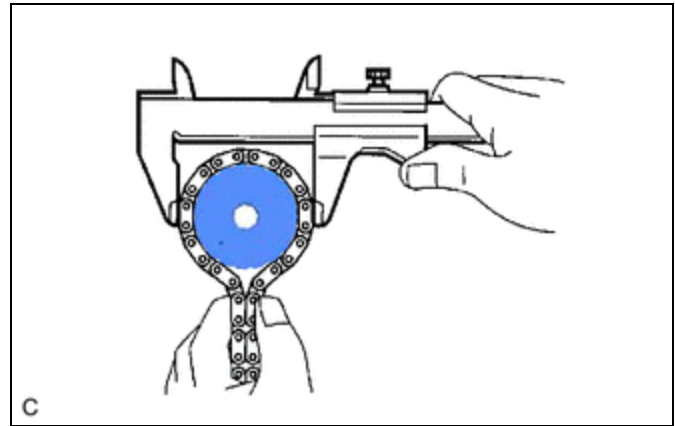
Post-procedure1

(d) None

8. INSPECT OIL PUMP DRIVE SHAFT SPROCKET

Pre-procedure1

(a) Place the oil pump drive chain sub-assembly around the oil pump drive shaft sprocket.



Procedure1

(b) Using a vernier caliper, measure the diameter of the oil pump drive shaft sprocket and oil pump drive chain sub-assembly.

Minimum Sprocket Diameter (with Oil Pump Drive Chain Sub-assembly):

SPECIFIED CONDITION	RESULT
51.35 mm	mm
2.02 in.	in.

NOTICE:

The vernier caliper must be in contact with the chain rollers when measuring.

(c) If the diameter is less than the minimum, replace the oil pump drive chain sub-assembly and oil pump drive shaft sprocket.

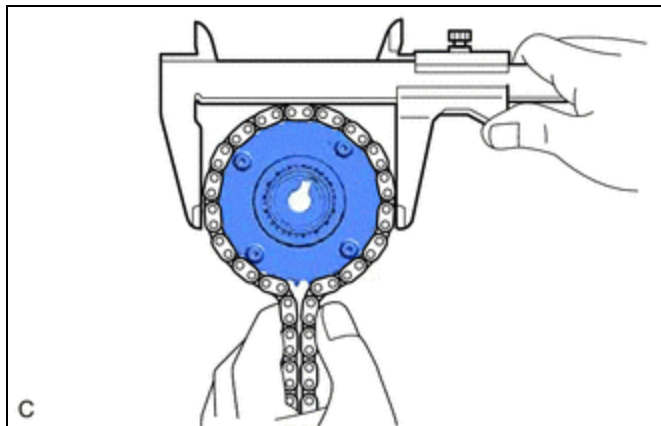
Post-procedure1

(d) None

9. INSPECT CAMSHAFT TIMING GEAR ASSEMBLY

Pre-procedure1

(a) Place the chain sub-assembly around the camshaft timing gear assembly.



Procedure1

- (b) Using a vernier caliper, measure the diameter of the camshaft timing gear assembly and chain sub-assembly.
Minimum Gear Diameter (with Chain Sub-assembly):

SPECIFIED CONDITION	RESULT
100.01 mm 3.94 in.	mm in.

NOTICE:

The vernier caliper must be in contact with the chain rollers when measuring.

- (c) If the diameter is less than the minimum, replace the chain sub-assembly and camshaft timing gear assembly.

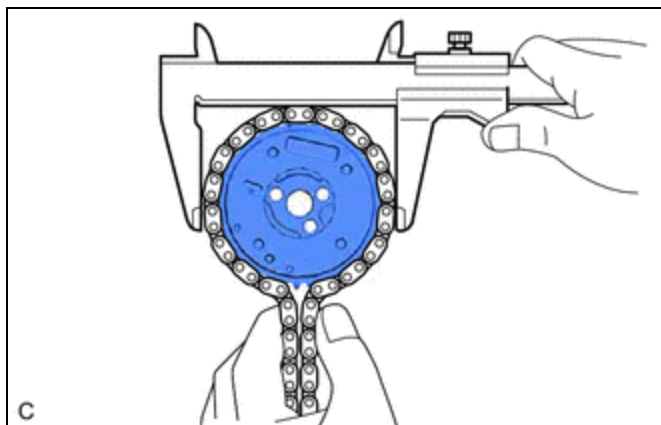
Post-procedure1

- (d) None

10. INSPECT CAMSHAFT TIMING EXHAUST GEAR ASSEMBLY

Pre-procedure1

- (a) Place the chain sub-assembly around the camshaft timing exhaust gear assembly.



Procedure1

(b) Using a vernier caliper, measure the diameter of the camshaft timing exhaust gear assembly and chain sub-assembly.

Minimum Gear Diameter (with Chain Sub-assembly):

SPECIFIED CONDITION	RESULT
100.01 mm 3.94 in.	mm in.

NOTICE:

The vernier caliper must be in contact with the chain rollers when measuring.

(c) If the diameter is less than the minimum, replace the chain sub-assembly and camshaft timing exhaust gear assembly.

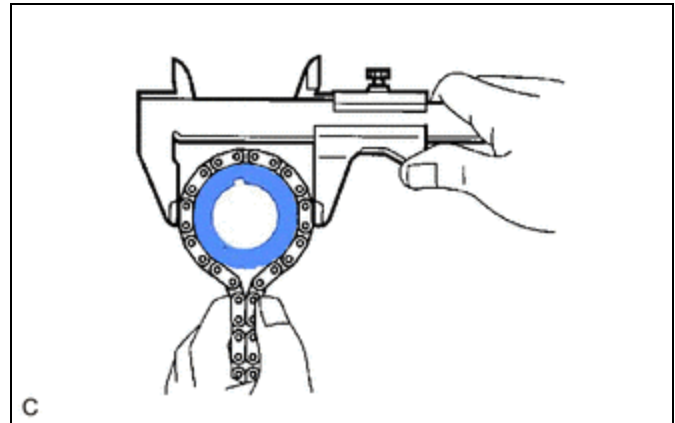
Post-procedure1

(d) None

11. INSPECT CRANKSHAFT TIMING SPROCKET

Pre-procedure1

(a) Place the chain sub-assembly around the crankshaft timing sprocket.



Procedure1

(b) Using a vernier caliper, measure the diameter of the crankshaft timing sprocket and chain sub-assembly.

Minimum Sprocket Diameter (with Chain Sub-assembly):

SPECIFIED CONDITION	RESULT
51.35 mm 2.02 in.	mm in.

NOTICE:

The vernier caliper must be in contact with the chain rollers when measuring.

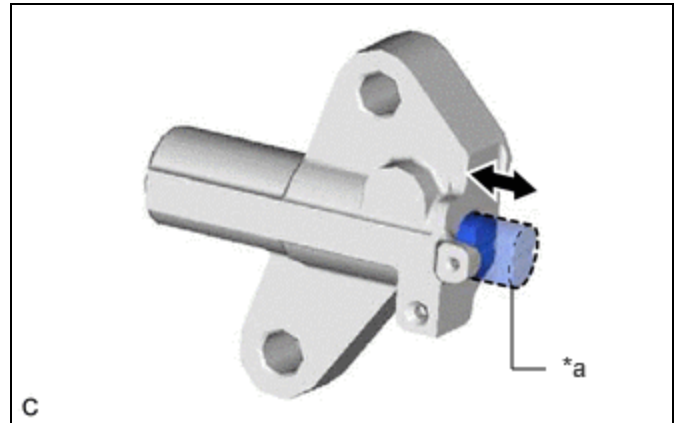
(c) If the diameter is less than the minimum, replace the chain sub-assembly and crankshaft timing sprocket.

Post-procedure1

(d) None

12. INSPECT NO. 1 CHAIN TENSIONER ASSEMBLY

(a) Push the plunger and check that it moves smoothly.



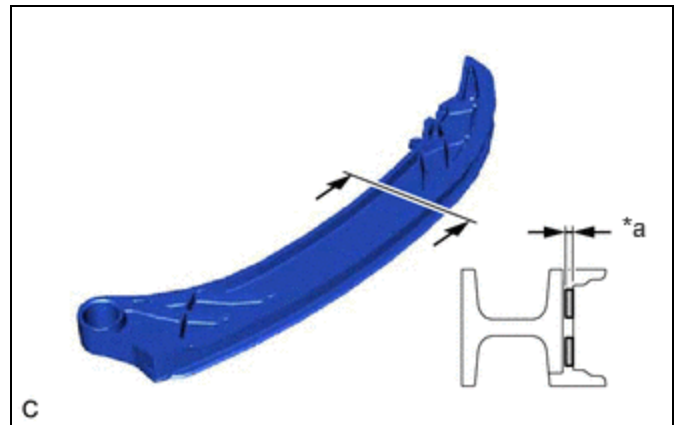
*a	Plunger
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(b) If the plunger does not move smoothly, replace the No. 1 chain tensioner assembly.

13. INSPECT CHAIN TENSIONER SLIPPER

(a) Using a vernier caliper, measure the wear depth of the chain tensioner slipper.

Maximum Depth:



*a	Depth
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(b) If the depth is more than the maximum, replace the chain tensioner slipper.

14. INSPECT NO. 1 CHAIN VIBRATION DAMPER

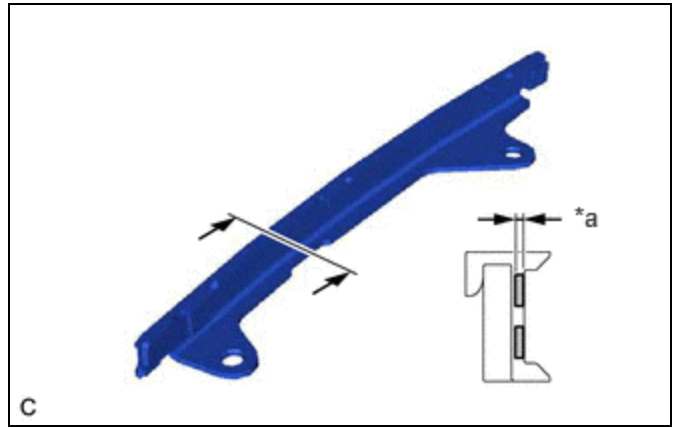
(a) Using a vernier caliper, measure the wear depth of the No. 1 chain vibration damper.

Maximum Depth:

SPECIFIED CONDITION	RESULT
1.0 mm	mm
0.0394 in.	in.

HINT:

Wear of the No. 1 chain vibration damper starts from the part where the chain plate of the chain sub-assembly contacts.



*a	Depth
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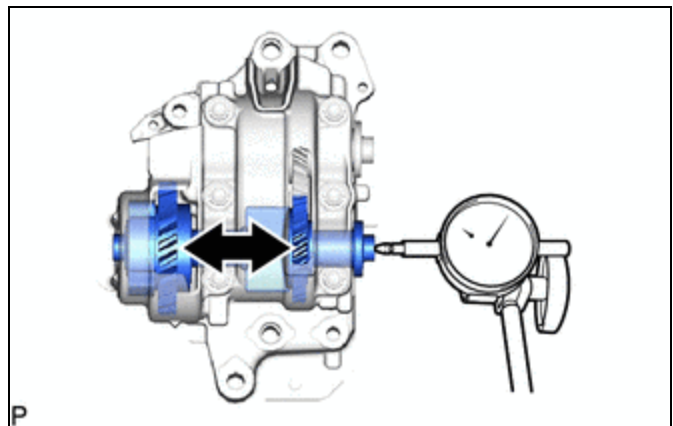
(b) If the depth is more than the maximum, replace the No. 1 chain vibration damper.

15. INSPECT NO. 1 BALANCE SHAFT THRUST CLEARANCE

(a) Using a dial indicator, measure the thrust clearance while moving the No. 1 balance shaft back and forth.

Standard Thrust Clearance:

MAXIMUM THRUST CLEARANCE	SPECIFIED CONDITION	RESULT
0.09 mm 0.00354 in.	0.05 to 0.09 mm 0.00197 to 0.00354 in.	mm in.



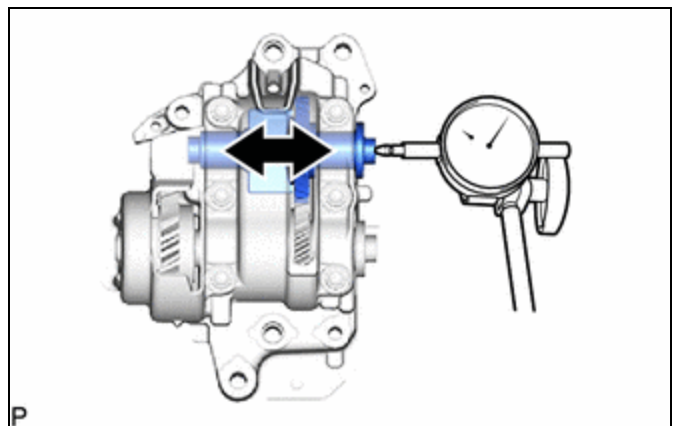
(b) If the thrust clearance is more than the maximum, replace the engine balancer assembly.

16. INSPECT NO. 2 BALANCE SHAFT THRUST CLEARANCE

(a) Using a dial indicator, measure the thrust clearance while moving the No. 2 balance shaft back and forth.

Standard Thrust Clearance:

MAXIMUM THRUST CLEARANCE	SPECIFIED CONDITION	RESULT
0.09 mm 0.00354 in.	0.05 to 0.09 mm 0.00197 to 0.00354 in.	mm in.

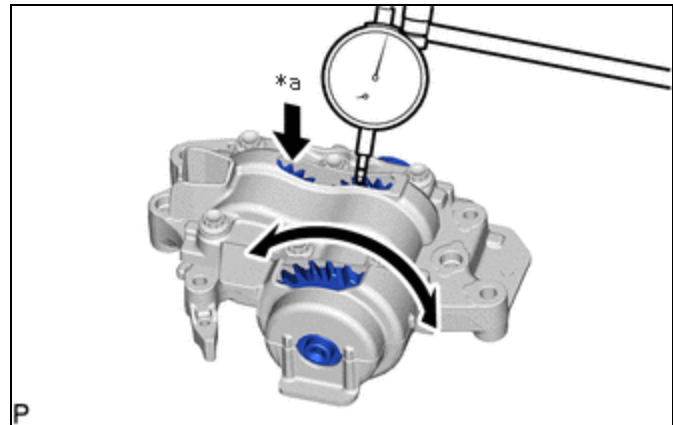


(b) If the thrust clearance is more than the maximum, replace the engine balancer assembly.

17. INSPECT BALANCE SHAFT BACKLASH

(a) Secure the No. 1 balance shaft in place, and then using a dial indicator, measure the backlash of the No. 1 balance shaft and No. 2 balance shaft as shown in the illustration.

Standard Backlash:



*a	Secure
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MAXIMUM BACKLASH	SPECIFIED CONDITION	RESULT
0.155 mm 0.00610 in.	0.045 to 0.155 mm 0.00177 to 0.00610 in.	mm in.

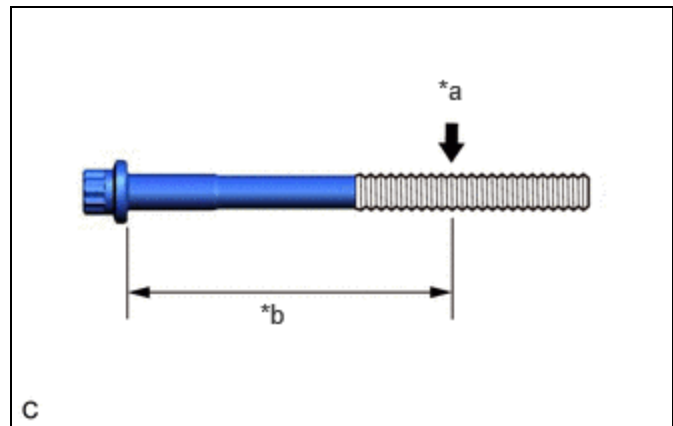
(b) If the backlash is more than the maximum, replace the engine balancer assembly.

18. INSPECT CYLINDER HEAD SET BOLT

(a) for 140 mm cylinder head set bolt:

(1) Using a vernier caliper, measure the diameter of the threads at the measurement point.

Standard Diameter:



*a	Measurement Point
*b	105 mm

MEASUREMENT POINT (DISTANCE FROM THE SEAT)	MINIMUM DIAMETER	SPECIFIED CONDITION	RESULT
105 mm 4.13 in.	10.6 mm 0.417 in.	10.7 to 10.9 mm 0.421 to 0.429 in.	mm in.

(2) If the diameter is less than the minimum:

Replace the cylinder head set bolt with a new one. Failure to do so may lead to engine damage.

(3) If there is any thread deformation:

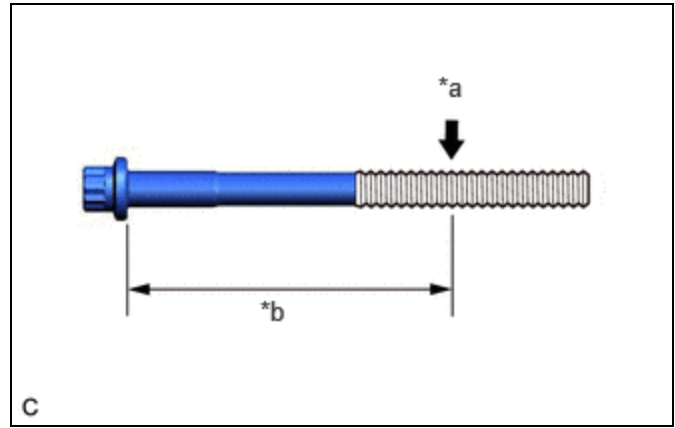
Replace the cylinder head set bolt with a new one.

(b) for 130 mm cylinder head set bolt:

(1) Using a vernier caliper, measure the diameter of the threads at the measurement point.

Standard Diameter:

MEASUREMENT POINT (DISTANCE FROM THE SEAT)	MINIMUM DIAMETER	SPECIFIED CONDITION	RESULT
115 mm 4.53 in.	9.6 mm 0.378 in.	9.7 to 9.9 mm 0.382 to 0.390 in.	mm in.



*a	Measurement Point
*b	115 mm

(2) If the diameter is less than the minimum:

Replace the cylinder head set bolt with a new one. Failure to do so may lead to engine damage.

(3) If there is any thread deformation:

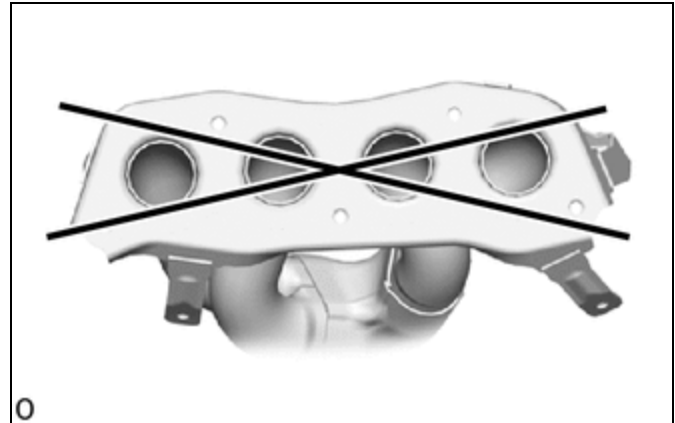
Replace the cylinder head set bolt with a new one.

19. INSPECT EXHAUST MANIFOLD (TWC: Front Catalyst)

(a) Using a precision straightedge and feeler gauge, check the surface that contacts the cylinder head sub-assembly for warpage.

Maximum Warpage:

SPECIFIED CONDITION	RESULT
0.7 mm 0.0276 in.	mm in.

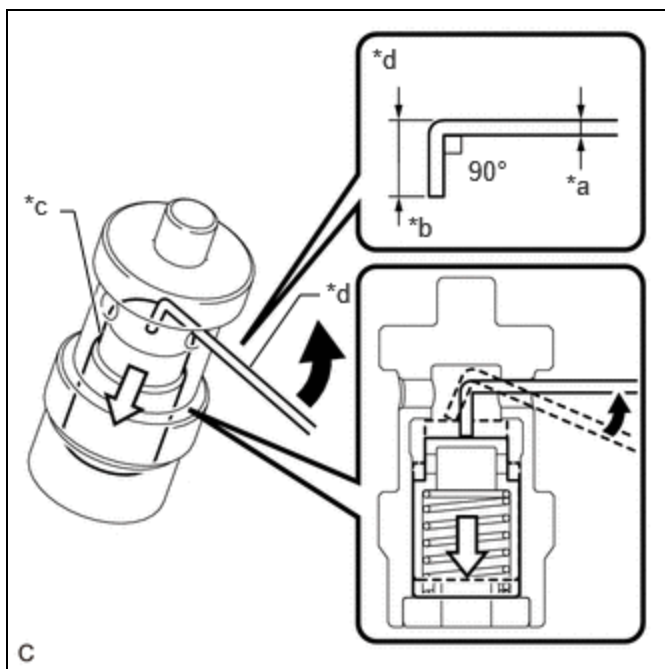


(b) If the warpage is more than the maximum, replace the exhaust manifold (TWC: Front Catalyst).

20. INSPECT OIL NOZZLE VALVE SUB-ASSEMBLY

Pre-procedure1

(a) Form a 1.0 mm (0.0394 in.) diameter piece of wire to the shape shown in the illustration.



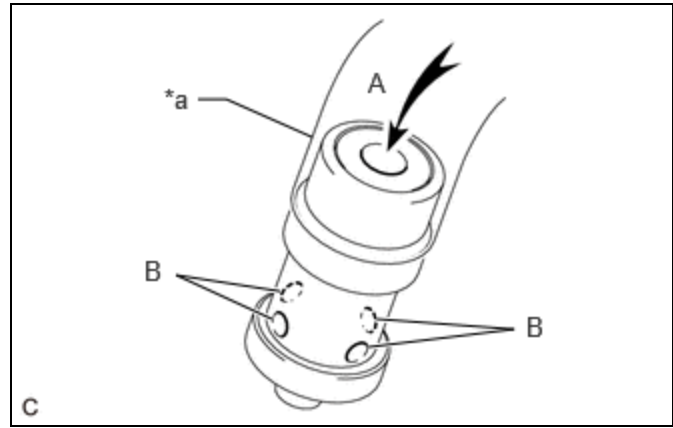
*a	1 mm (0.0394 in.)
*b	5 mm (0.197 in.)
*c	Check Valve
*d	Wire
	Move the wire in this direction.
	Movement of Check Valve

Procedure1

(b) Using a piece of wire, check that the check valve is not stuck.

Pre-procedure2

(c) Connect a hose to the oil nozzle valve sub-assembly.

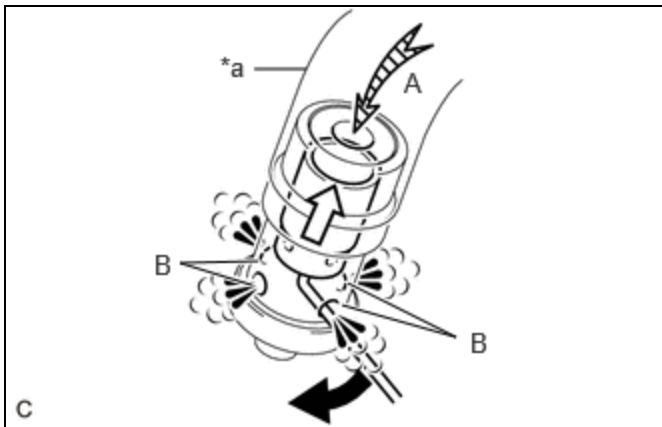


*a	Hose
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Procedure2

(d) Check that air does not leak from the port (B) when blowing air into the port (A).

(e) With the check valve depressed using a piece of wire, check that air flows from the port (B) when blowing air into the port (A).



*a	Hose
	Move the wire in this direction.
	Movement of Check Valve

Post-procedure1

(f) Disconnect the hose from the oil nozzle valve sub-assembly.

(g) If the oil nozzle valve sub-assembly is stuck, clogged or leaks, replace it.

