1.

For basic mechanical concerns, REFER to: ENGINE SYSTEM - GENERAL INFORMATION . For driveability concerns, Refer to ENGINE CONTROLS - INTRODUCTION (EXCEPT DIESEL & HYBRID) .

GENERAL PROCEDURES > BALANCE SHAFT BACKLASH

Special Tool(s) / General Equipment

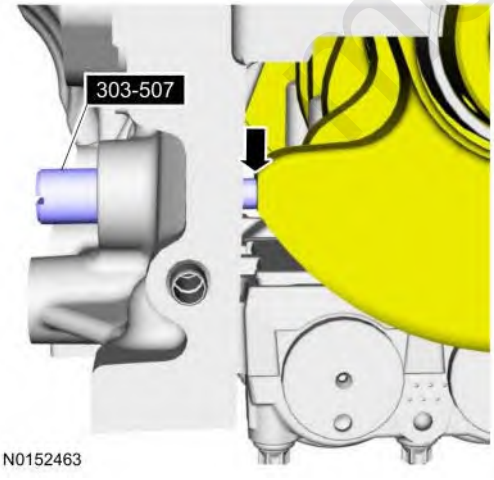
 E139373	100-002 (TOOL-4 201-C) Holding Fixture with Dial Indicator Gauge
 PZ21210	303-507 Timing Peg, Crankshaft TDC TKIT-2001N-FLM TKIT-2001N-ROW

Check

1.

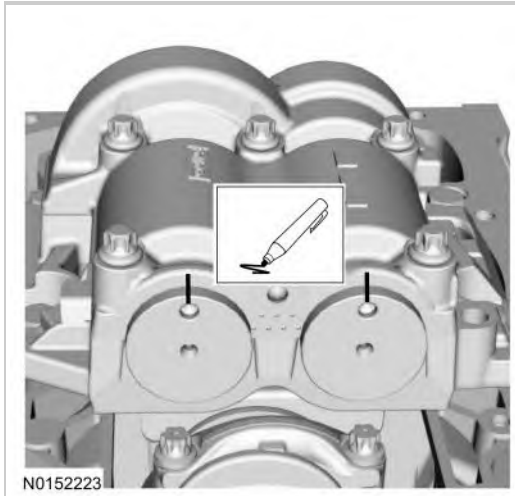
Install the special tool and rotate the crankshaft slowly clockwise until the crankshaft balance weight is up against the Crankshaft TDC Timing Peg. The engine is now at TDC.

Use Special Service Tool: 303-507 Timing Peg, Crankshaft TDC.



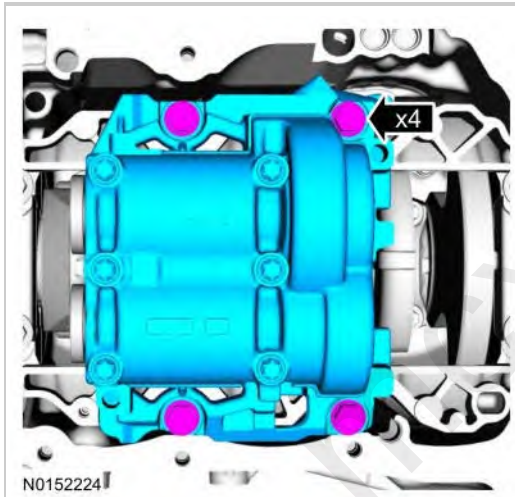
2.

Mark the balancer unit and shafts on the top for reference that the balancer unit is at TDC.



NOTE: Due to the precision interior construction of the balancer unit, it should not be disassembled.

3.
Remove the bolts and the balance unit.



4.

Remove the adjustment shims from the seat faces of the balancer unit.

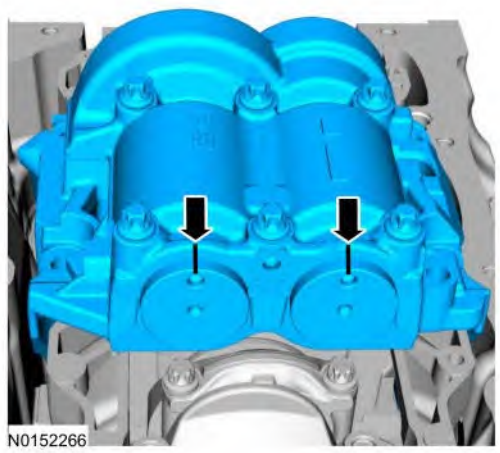
NOTE: Visually inspect the balancer unit gear for damage and verify that the shaft turns smoothly. If there is any damage or malfunction, replace the balancer unit.

5.
Install the master adjustment shims (No. 50) on the seat faces of the balancer unit.

6.

With the balancer unit shaft marks at the TDC position, slowly install the balancer unit to the

cylinder block to avoid interference between the crankshaft drive gear and the balancer unit driven gear.



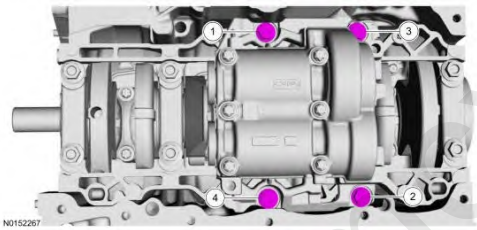
7.

Install the bolts and tighten.

Torque:

Stage 1: 18 lb.ft (25 Nm)

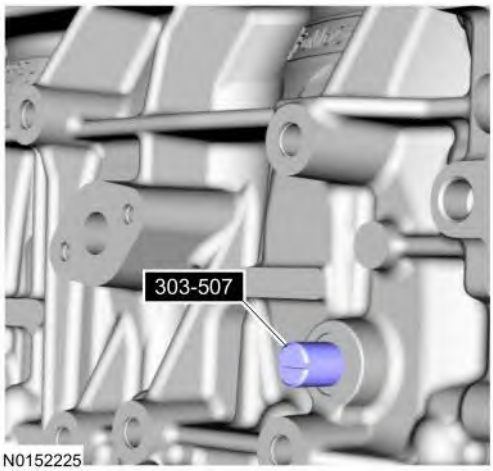
Stage 2: 31 lb.ft (42 Nm)



8.

Remove the special tool and rotate the crankshaft to confirm that there are no meshing problems between the balancer unit gear and the crankshaft gear.

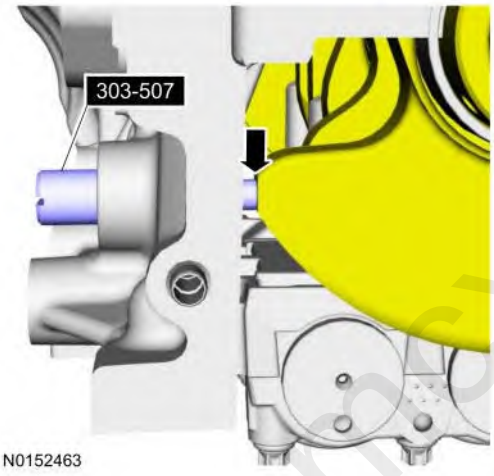
Use Special Service Tool: 303-507 Timing Peg, Crankshaft TDC.



9.

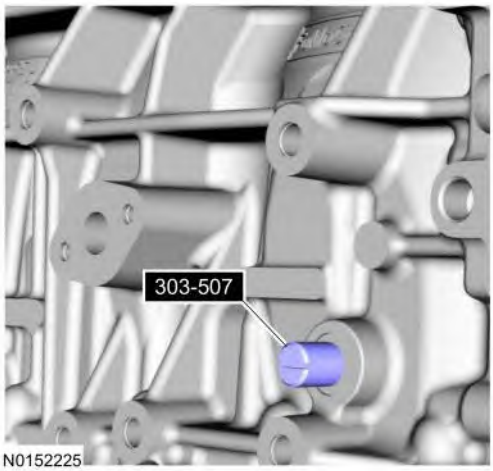
Install the special tool and rotate the crankshaft slowly clockwise until the crankshaft balance weight is up against the Crankshaft TDC Timing Peg. The engine is now at TDC.

Use Special Service Tool: 303-507 Timing Peg, Crankshaft TDC.



10.

Remove Special Service Tool: 303-507 Timing Peg, Crankshaft TDC.



NOTE: For an accurate measurement while measuring the gear backlash, insert a screwdriver as shown into the crankshaft No. 1 crankweight area and set both the rotation and the thrust direction with the screwdriver, using a prying action as shown in illustration below.

NOTE: The measurement must be taken with the Dial Indicator Gauge with Holding Fixture, a 5-mm Allen wrench and worm clamp set up as shown in illustration. Mark the Allen wrench with a file 80 mm (3.149 in) above the driven gear shaft center. Make sure the worm clamp and Allen wrench are not touching the balance shaft housing.

NOTE: Measure the backlash and verify that it is within specified range at all of the following 6 positions: 10 degrees, 30 degrees, 100 degrees, 190 degrees, 210 degrees and 280 degrees. It will be necessary to reset the measuring equipment between measurements.

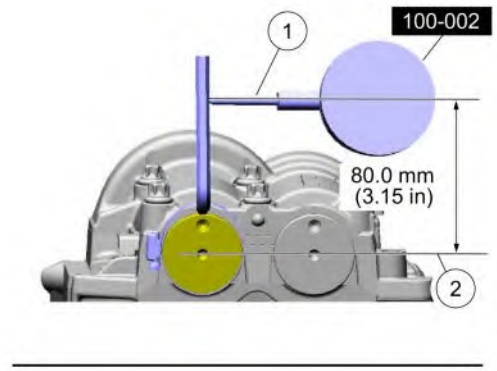
11.

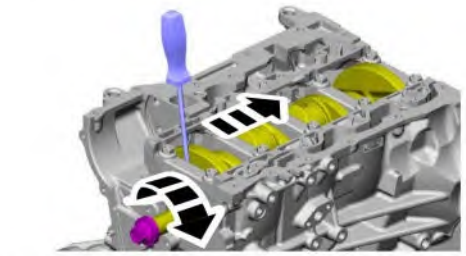
Position as shown in illustration. Measure the gear backlash.

Use Special Service Tool: 100-002 (TOOL-4201-C) Holding Fixture with Dial Indicator Gauge.

Position the Dial Indicator Gauge with Holding Fixture (1) on the Allen wrench 80 mm (3.149 in) above the driven gear shaft center (2) on the balancer unit.

Rotate the crankshaft clockwise and measure the backlash at all of the following 6 positions: 10 degrees, 30 degrees, 100 degrees, 190 degrees, 210 degrees and 280 degrees.





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NOTE: If maximum backlash exceeds 0.140 mm (0.0055 in), install a new balancer unit.

12.

Using the backlash measurement, select the proper shims from the Adjustment Shim Selection Table in illustration below.

Remove the balancer unit from the cylinder block.

Install the selected adjustment shims on the seat faces of the balancer unit.

ADJUSTMENT SHIM SELECTION TABLE

Backlash mm (in)	Selection shim (No.)	Shim thickness mm (in)	Backlash mm (in)	Selection shim (No.)	Shim thickness mm (in)
0.516-0.538 (0.0203-0.0207)	15	1.15 (0.0452)	0.345-0.367 (0.0095-0.0101)	35	1.35 (0.0531)
0.502-0.514 (0.0197-0.0202)	16	1.16 (0.0456)	0.232-0243 (0.0091-0.0095)	36	1.36 (0.535)
0.489-0.500 (0.0192-0.0196)	17	1.17 (0.0460)	0.218-0.230 (0.0085-0.0090)	37	1.37 (0.539)
0.475-0.487 (0.0187-0.0191)	18	1.18 (0.0464)	0.205-.0216 (0.0080-0.0085)	38	1.38 (0.0543)
0.462-0.473 (0.0181-0.0186)	19	1.19 (0.0458)	0.191-0.203 (0.0075-0.0079)	39	1.39 (0.0547)
0.448-0.460 (0.0176-0.0181)	20	1.20 (0.0472)	0.178-0.189 (0.0070-0.0074)	40	1.40 (0.0551)
0.435-0.446 (0.0171-0.0175)	21	1.21 (0.0476)	0.164-0.176 (0.0064-0.0069)	41	1.41 (0.0555)
0.421-0.433 (0.0165-0.0170)	22	1.22 (0.0480)	0.151-0.162 (0.0059-0.0063)	42	1.42 (0.0559)
0.408-0.419 (0.0160-0.0164)	23	1.23 (0.0484)	0.137-0.149 (0.0053-0.0058)	43	1.43 (0.0562)
0.394-0.406 (0.0155-0.0159)	24	1.24 (0.0488)	0.124-0.135 (0.0048-0.0053)	44	1.44 (0.0566)
0.381-0.392 (0.0150-0.0154)	25	1.25 (0.492)	0.110-0.122 (0.0043-0.0048)	45	1.45 (0.0570)
0.367-0.379 (0.0144-0.0149)	26	1.26 (0.0496)	0.097-0.108 (0.0038-0.0042)	46	1.46 (0.0574)
0.354-0.365 (0.0139-0.0143)	27	1.27 (0.0499)	0.083-0.095 (0.0032-0.0037)	47	1.47 (0.0578)
0.340-0.352 (0.0133-0.0138)	28	1.28 (0.0503)	0.070-0.081 (0.0027-0.0031)	48	1.48 (0.0582)
0.327-0.338 (0.0128-0.0133)	29	1.29 (0.0507)	0.056-0.068 (0.0022-0.0026)	49	1.49 (0.0586)
0.313-0.325 (0.0123-0.0127)	30	1.30 (0.0511)	0.043-0.054 (0.0016-0.0021)	50 (master)	1.50 (0.0590)
0.300-0.311 (0.0118-0.0122)	31	1.31 (0.0515)	0.029-0.041 (0.0011-0.0016)	51	1.51 (0.0594)
0.286-0.298 (0.0112-0.0117)	32	1.32 (0.0519)	0.015-0.027 (0.0005-0.0010)	52	1.52 (0.0598)
0.272-0.284 (0.0107-0.0111)	33	1.33 (0.0523)	0.002-0.014 (0.00007-0.0005)	53	1.53 (0.0602)
0.259-0.271 (0.0101-0.0106)	34	1.34 (0.0527)	0.000-0.000 (0.0000-0.0000)	54	1.54 (0.0606)

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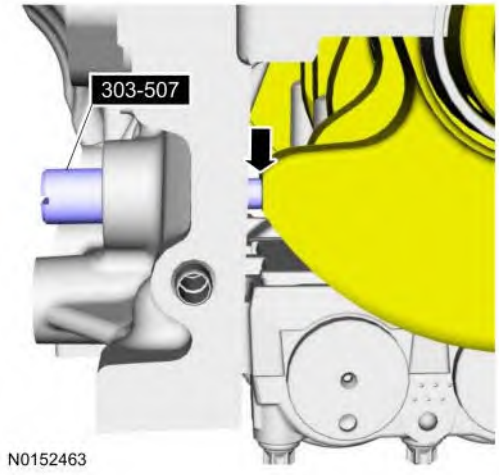
13.

Install the special tool and rotate the crankshaft slowly clockwise until the crankshaft balance

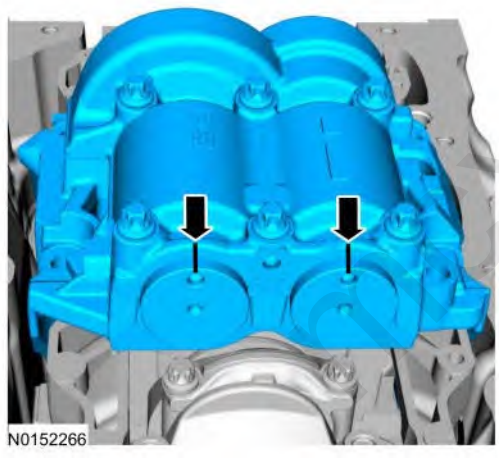
weight is up against the Crankshaft TDC Timing Peg. The engine is now at TDC.

Use Special Service Tool: 303-507 Timing Peg, Crankshaft TDC.



14.

With the balancer unit shaft marks at the TDC position, slowly install the balancer unit to the cylinder block to avoid interference between the crankshaft drive gear and the balancer unit driven gear.



15.

Install the bolts and tighten.

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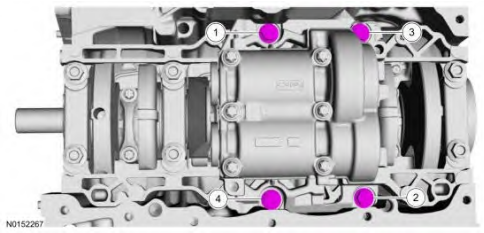
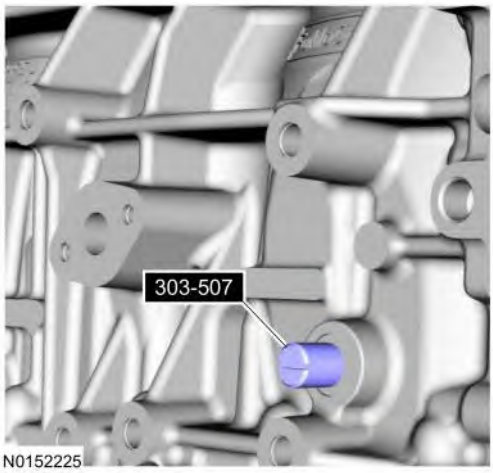
Stage 2: 31 lb.ft (42 Nm)



16.

Remove Special Service Tool: 303-507 Timing Peg, Crankshaft TDC.



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17.

Position as shown in illustration. Measure the gear backlash.

Use Special Service Tool: 100-002 (TOOL-4201-C) Holding Fixture with Dial Indicator Gauge.