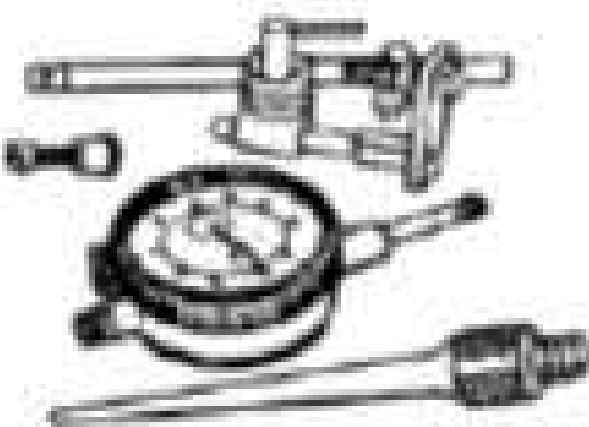



GENERAL PROCEDURES

BALANCE SHAFT BACKLASH

SPECIAL TOOL(S) DESCRIPTION

 A technical drawing of a dial indicator gauge assembly. It includes a circular dial with a needle, a long vertical stem, and various mounting brackets and fixtures used to hold the gauge in place for measurement.	<p>Dial Indicator Gauge With Holding Fixture 100-002TOOL-4201-C</p>
 A technical drawing of a timing peg. It consists of a long, thin metal rod with a textured, cylindrical head at one end, designed to fit into a specific slot on a crankshaft to indicate Top Dead Center (TDC).	<p>Timing Peg, Crankshaft TDC 303-507</p>

General Procedure

1. Install the 303-507 and rotate the crankshaft slowly clockwise until the crankshaft balance weight is up against the 303-507. The engine is now at **TDC** .

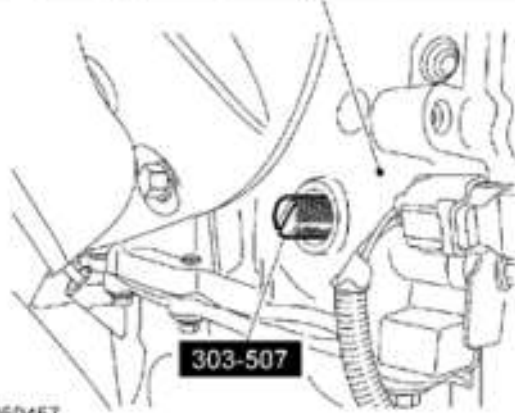
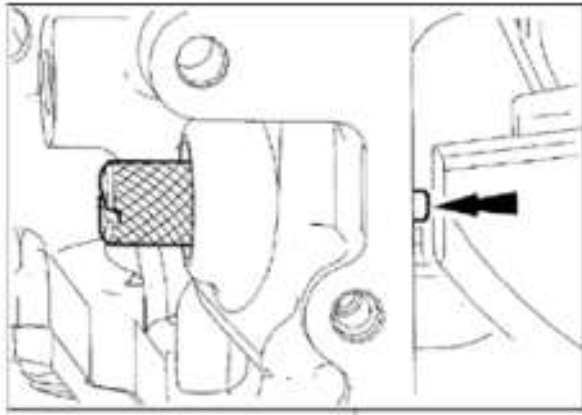


Fig. 3: View Of Timing Peg, Crankshaft TDC
 Courtesy of FORD MOTOR CO.

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

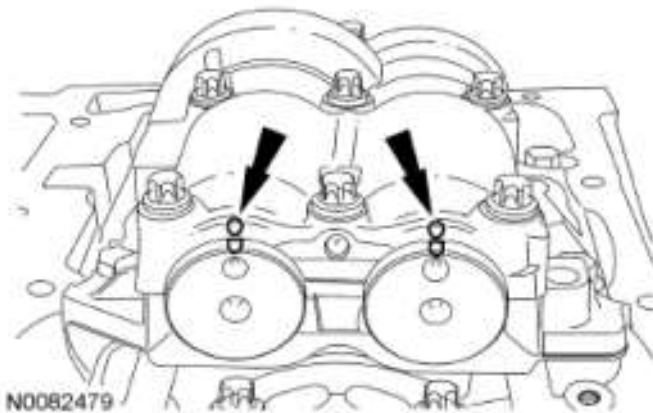


Fig. 4: Locating Balancer Unit And Shafts Matching Marks
 Courtesy of FORD MOTOR CO.

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

- 3.

Remove the 4 bolts and the balancer unit.

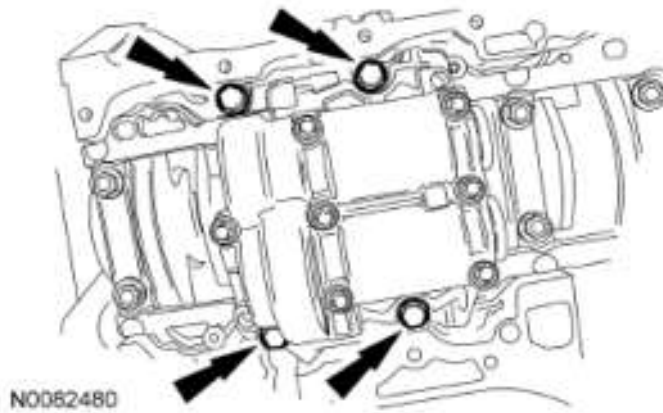


Fig. 5: Locating Balancer Unit Mounting Bolts
 Courtesy of FORD MOTOR CO.

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.

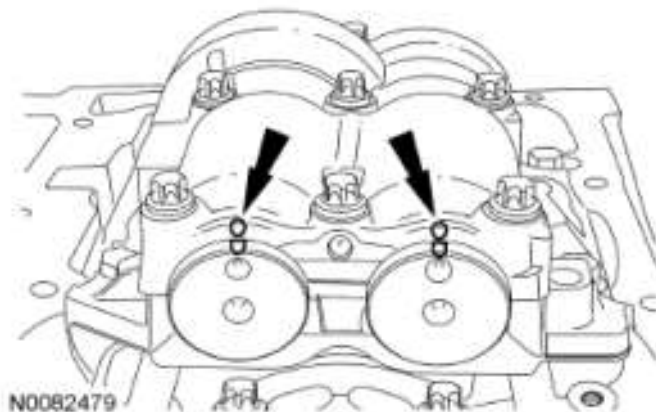


Fig. 6: Locating Balancer Unit And Shafts Matching Marks
 Courtesy of FORD MOTOR CO.

7. Install the balancer unit bolts.
 - Tighten in the sequence shown in illustration in 2 stages.
 - Stage 1: Tighten to 25 Nm (18 lb-ft).
 - Stage 2: Tighten to 42 Nm (31 lb-ft).

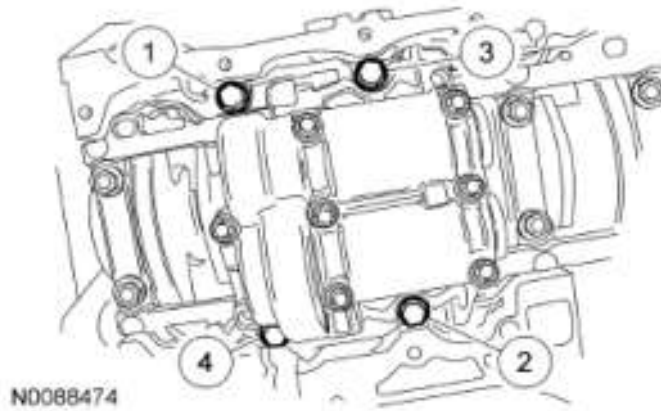


Fig. 7: Balancer Unit Mounting Bolts Tightening Sequence
Courtesy of FORD MOTOR CO.

8. Remove the 303-507.
 - Rotate the crankshaft to confirm that there are no meshing problems between the balancer unit gear and the crankshaft gear.

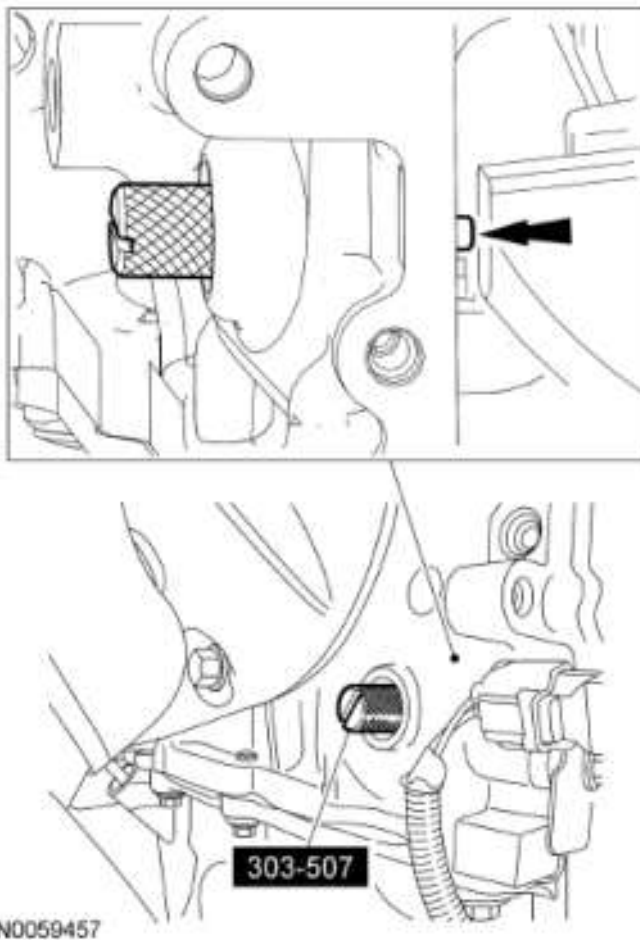


Fig. 8: View Of Timing Peg, Crankshaft TDC
Courtesy of FORD MOTOR CO.

9. Install the 303-507 and rotate the crankshaft slowly clockwise until the crankshaft balance weight is up against the 303-507.

- Remove the 303-507.

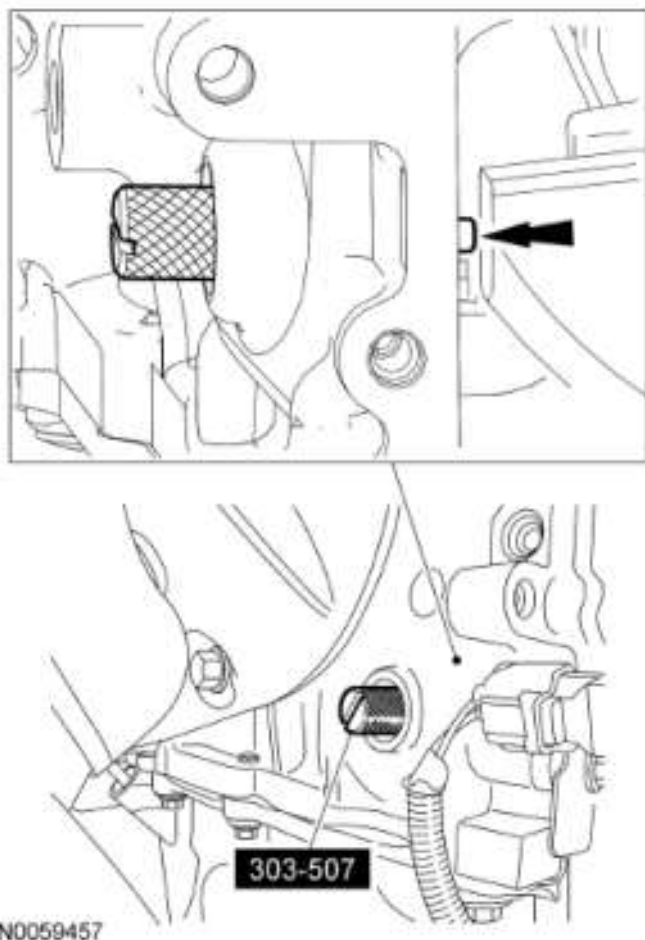


Fig. 9: View Of Timing Peg, Crankshaft TDC
 Courtesy of FORD MOTOR CO.

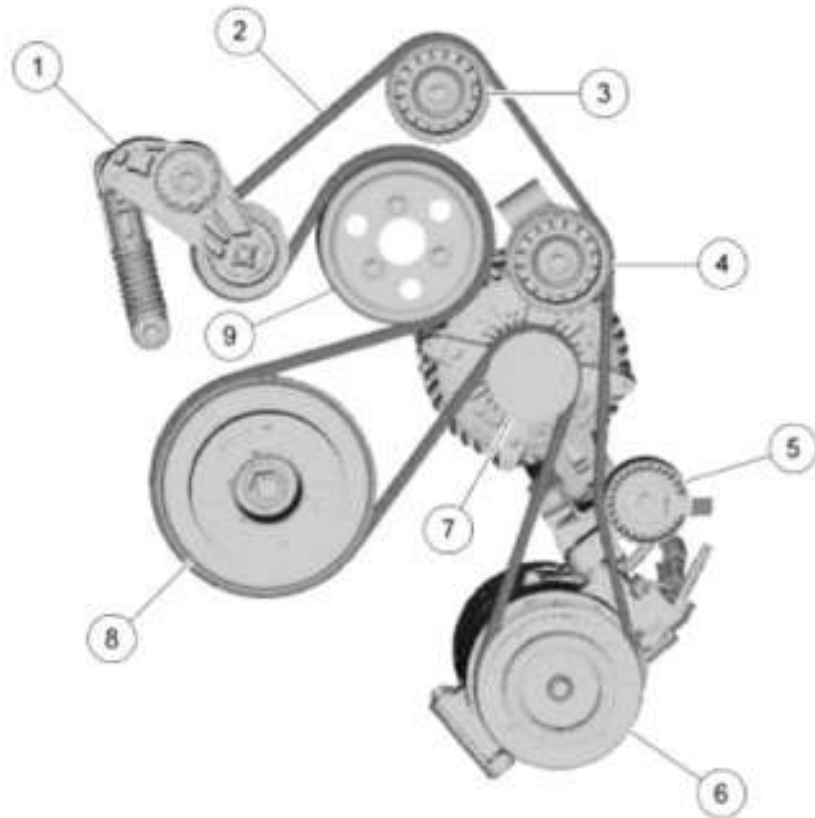
10. **NOTE:** Measure the backlash and verify that it is within specified range at all of the following 6 positions: 10 degrees, 30 degrees, 100 degrees, 190 degrees, 210 degrees and 280 degrees. It will be necessary to reset the measuring equipment between measurements.

NOTE: The measurement must be taken with the 100-002 TOOL-4201-C, 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: For an accurate measurement while measuring the gear backlash, insert a screwdriver as shown in illustration 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.

Position the 100-002 TOOL-4201-C as shown in illustration. Measure the gear backlash.

- Position the 100-002 TOOL-4201-C (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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Fig. 10: Measuring Gear Backlash Using Tool
 Courtesy of FORD MOTOR CO.

11. **NOTE:** If maximum backlash exceeds 0.120 mm (0.0047 in), install a new balancer unit.

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

- Remove the balancer unit from the cylinder block.
- Install the selected adjustment shims on the seat faces of the balancer unit.

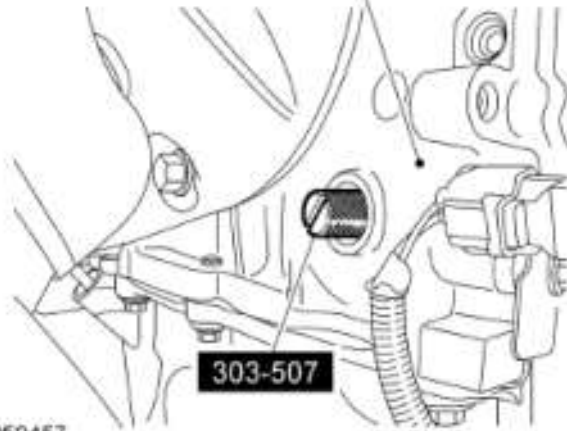
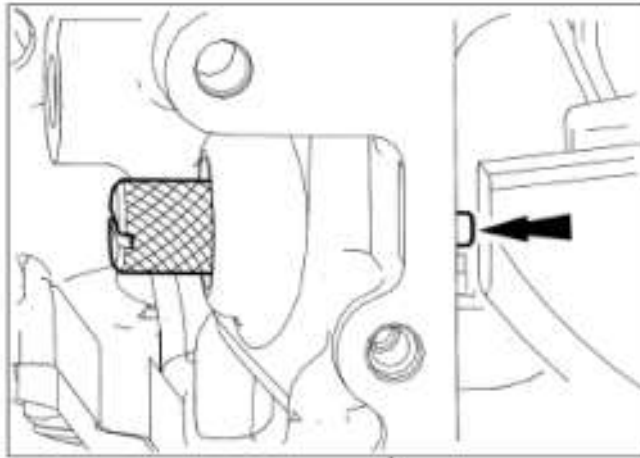
ADJUSTMENT SHIM SELECTION TABLE

Backlash mm (in)	Selection shim (No.)	Shim thickness mm (in)	Backlash mm (in)	Selection shim (No.)	Shim thickness mm (in)
0.516-0.528 (0.0203-0.0207)	15	1.15 (0.0452)	0.245-0.257 (0.0096-0.0101)	35	1.35 (0.0531)
0.502-0.514 (0.0197-0.0202)	16	1.16 (0.0456)	0.232-0.243 (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)	0.205-0.216 (0.0080-0.0085)	38	1.38 (0.0543)
0.462-0.473 (0.0181-0.0186)	19	1.19 (0.0468)	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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Fig. 11: Adjustment Shim Selection Chart
 Courtesy of FORD MOTOR CO.

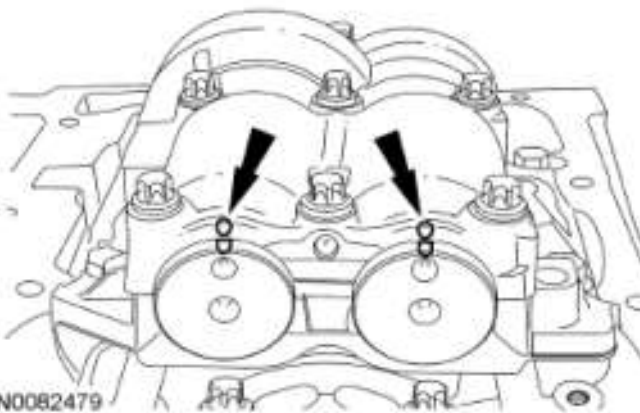
12. Install the 303-507 and rotate the crankshaft slowly clockwise until the crankshaft balance weight is up against the 303-507. The engine is now at **TDC** .



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Fig. 12: View Of Timing Peg, Crankshaft TDC
Courtesy of FORD MOTOR CO.

13. With the balancer unit shaft marks in 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.



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Fig. 13: Locating Balancer Unit And Shafts Matching Marks
Courtesy of FORD MOTOR CO.

14. Install the balancer unit bolts.
 - Tighten in the sequence shown in illustration in 2 stages.

- Stage 1: Tighten to 25 Nm (18 lb-ft).
- Stage 2: Tighten to 42 Nm (31 lb-ft).

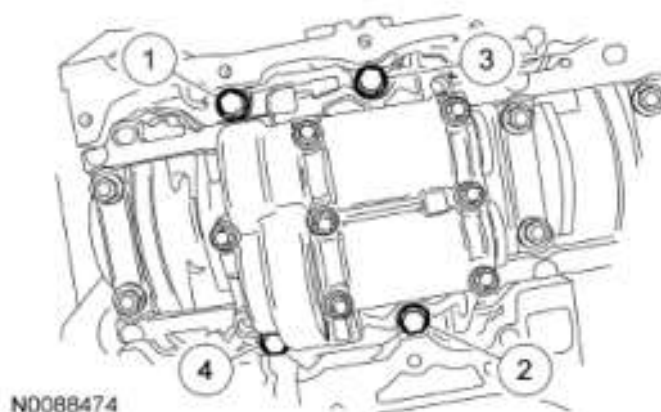


Fig. 14: Balancer Unit Mounting Bolts Tightening Sequence
 Courtesy of FORD MOTOR CO.

15. **NOTE:** Remeasure 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.

NOTE: The measurement must be taken with the 100-002 TOOL-4201-C, 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: For an accurate measurement while measuring the gear backlash, insert a screwdriver as shown in illustration 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.

Position the 100-002 TOOL-4201-C as shown in illustration. Measure the gear backlash.

- Position the 100-002 TOOL-4201-C (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.
- If the backlash exceeds the specified range of 0.020 to 0.120 mm (0.0008 to 0.0047 in), install a new balancer unit and repeat the procedure.

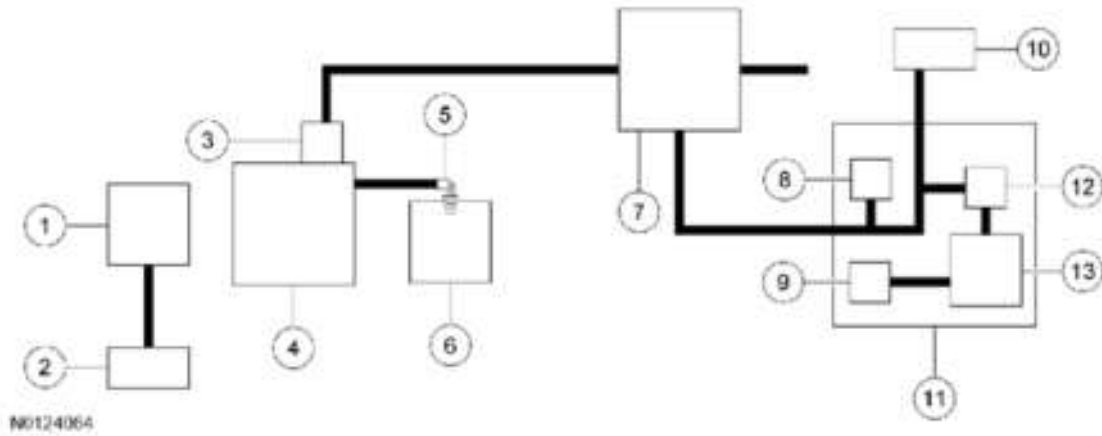


Fig. 15: Measuring Gear Backlash Using Tool
 Courtesy of FORD MOTOR CO.

VALVE CLEARANCE CHECK

General Procedure

WARNING: Before beginning any service procedure, refer to **SAFETY WARNINGS**. Failure to follow this instruction may result in serious personal injury.

1. Remove the valve cover. Refer to **VALVE COVER**.
2. Remove the RH fender splash shield. REFER to **FENDER SPLASH SHIELD**.
3. **NOTE:** Turn the engine clockwise only, and only use the crankshaft bolt.

NOTE: Before removing the camshafts, measure the clearance of each valve at base circle, with the lobe pointed away from the tappet. Failure to measure all clearances prior to removing the camshafts will necessitate repeated removal and installation and wasted labor time.

Use a feeler gauge to measure the clearance of each valve and record its location.

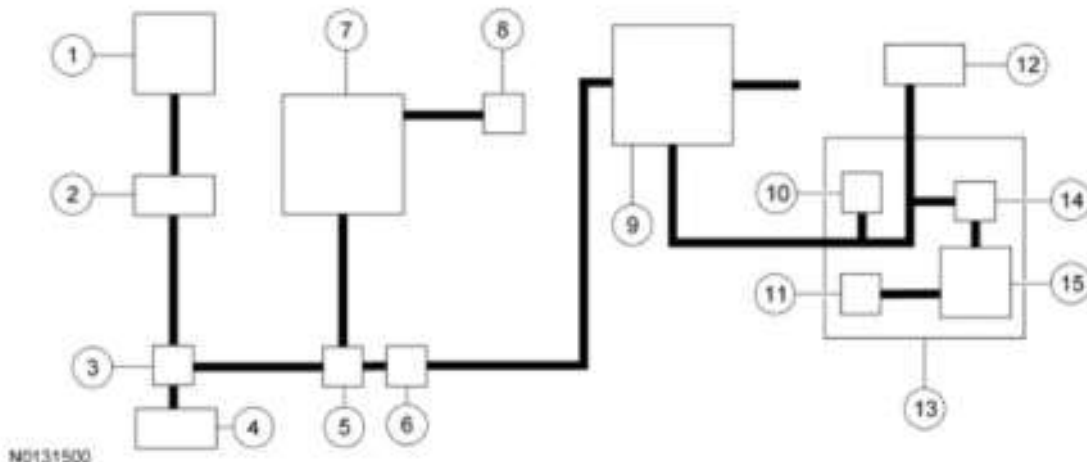


Fig. 16: Measuring Valve Clearance Using Feeler Gauge

Courtesy of FORD MOTOR CO.

4. **NOTE:** The number on the valve tappet only reflects the digits that follow the decimal. For example, a tappet with the number 0.650 has the thickness of 3.650 mm (0.144 in).

- NOTE:** The nominal clearance is:
- intake: 0.25 mm (0.0098 in).
 - exhaust: 0.36 mm (0.0142 in).

- NOTE:** The acceptable clearances after being fully installed are:
- intake: 0.19 mm (0.007 in) to 0.31 mm (0.012 in).
 - exhaust: 0.30 mm (0.012 in) to 0.42 mm (0.017 in).

- NOTE:** Select tappets using this formula: $\text{tappet thickness} = \text{measured clearance} + \text{the existing tappet thickness} - \text{nominal clearance}$.

Select the closest tappet size to the ideal tappet thickness available and mark the installation location.

5. If any tappets do not measure within specifications, install new tappets in these locations. Refer to VALVE TAPPETS.