### Engine

#### Special Tool(s)

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<td>D93-P6001-A3</td>
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<tr>
<td>Brackets, Engine Lifting</td>
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<td>Crankshaft Rear Seal Replacer</td>
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<td>Reamer, Cylinder Ridge</td>
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<td>Installer, Crankshaft Front Oil Seal</td>
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<td>Strap Wrench</td>
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<td>Brake/Clutch/Service Vacuum or equivalent</td>
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<td>Clutch Aligner</td>
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<td>Locking Tool, Flywheel</td>
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⚠️ **WARNING:** Clutches and brakes contain asbestos fibers. Avoid breathing dust. Breathing asbestos dust may cause asbestosis and cancer.

⚠️ **WARNING:** Clutching asbestos dust is hazardous to your health.

⚠️ **WARNING:** Dust and dirt present on wheel brake and clutch assemblies may contain asbestos fibers that are hazardous to your health when made airborne by cleaning with compressed air or by dry brushing.

⚠️ **WARNING:** Wheel brake assemblies and clutch facings should be cleaned using a vacuum cleaner recommended for use with asbestos fibers such as...
brake/clutch/service vacuum 164-R3600. Dust and dirt from vacuum should be disposed of in a manner that prevents dust exposure such as sealed bags. The bag must be labeled as per OSHA instructions and the trash hauler notified as to the bag's contents.

⚠️ WARNING: If a vacuum suitable for asbestos is not available, cleaning should be done wet. If dust generation is still possible, technicians should wear government approved toxic dust purifying respirators.

⚠️ WARNING: Grinding or sanding on brake linings, pads, rotors, drums or clutch facings should be done only while using properly exhaust-ventilated equipment.

⚠️ WARNING: OSHA requires areas where asbestos dust generation is possible to be isolated and posted with warning signs. Only technicians concerned with performing brake or clutch service should be present in the area.

⚠️ CAUTION: Loosen bolts evenly to prevent pressure plate damage.

NOTE: If the parts are to be reused, mark the clutch pressure plate and flywheel.

Vehicles with manual transaxle

1. Remove the bolts and remove the clutch pressure plate and clutch disc.

2. NOTE: Install a new pilot bearing only if it is worn or damaged.
   - If necessary, use the special tool to remove the pilot bearing.
   1. Install the special tool.
   2. Remove the pilot bearing.

All vehicles

3. NOTE: Manual flywheel is shown, automatic is similar.
   - Remove the flywheel or flexplate.

4. Remove dowels and the spacer(s).

5. Using the special tool, remove the crankshaft rear seal.
6. Remove the rear main oil seal retainer assembly and discard the gasket.

7. **NOTE:** Disconnect the connector.

   Remove the crankshaft position sensor (CKP) and the bushing.

8. Attach the engine to the engine stand.

9. Remove the water pump pulley.

10. Remove the water pump.
11. Remove the oil filter.

12. Remove the generator.

13. Remove the generator bracket.

14. Remove the bolt, then remove the crankshaft pulley.

15. Remove the power steering pressure hose and lower radiator hose.

16. Remove the bolts and the power steering pump.
17. Remove the dipstick tube.

18. Remove the power steering pump bracket.

19. Remove the A/C compressor bracket.

20. Remove the engine lifting eye.

21. Remove the heat shield.

22. Remove the exhaust manifold.
   - Remove the retainers in the sequence shown.
   - Remove the exhaust manifold.
   - Remove the exhaust manifold gasket.
23. **NOTE:** Cut the tie strap securing the crankshaft position sensor wiring to the coolant tube.

Remove the water bypass tube.

24. Disconnect the crankshaft and temperature sensors.

25. Disconnect the ignition coil and the sensors.

26. Disconnect the harness and cut the tie strap.

27. Remove the crankcase ventilation hose assembly.

28. Disconnect the throttle position and fuel pressure sensors.
   - Disconnect the connectors from the bracket.
   - Disconnect the vacuum hose.
29. Remove the throttle body.

30. Disconnect the idle air control (IAC) valve electrical connector.

31. Disconnect the knock sensor.

32. Disconnect the variable camshaft timing oil control solenoid.

33. **NOTE:** Disconnect the harness from the valve cover stud.

   Remove the fuel charging wiring harness.
   - Remove the screws.
   - Disconnect the fuel injectors.

34. Remove the thermostat housing.
35. Remove the accelerator cable bracket.

36. Disconnect the ignition wires from the spark plugs.

37. Remove the ignition coil, wires and bracket as an assembly.

38. Remove the PCV valve hose.

39. **NOTE:** Shown with the fuel injection removed for clarity.

   Remove the intake manifold.
   - Remove the two nuts and the five bolts in the sequence shown.

40. Remove the knock sensor.
41. Remove the oil pressure sending unit.

42. Remove the oil separator.
   - Remove the bolts.
   - Remove the oil separator.
   - Remove the oil separator to cylinder block gasket and discard.

43. Remove the camshaft position sensor (CMP).

44. Remove the upper timing belt cover.

45. Remove the valve cover.
   - Fully loosen the ten bolts.
   - Remove the valve cover.
   - Remove the valve cover gasket.

46. Remove the center timing belt cover.

47. Remove the lower timing belt cover.
48. **CAUTION:** The spark plug must be removed for the timing adjustment.

   Remove the spark plugs.

49. Remove the timing belt tensioner and the timing belt.

50. **NOTE:** Hold the camshaft at the hexagons with locking pliers to prevent camshaft rotation.

   Remove the oil plug on the variable camshaft timing assembly.

51. **NOTE:** Hold the camshaft at the hexagons with locking pliers to prevent camshaft rotation.

   Remove the camshaft sprockets.

52. Remove the timing belt idler pulley.

53. Remove the timing cover back plate.
54. Remove water pump housing.

55. Remove the crankshaft sprocket and timing belt guide.

56. Remove the crankshaft key.

57. Remove the variable camshaft timing oil flange feed bolts.

58. Rotate the oil control solenoid assembly 90 degrees.

59. **CAUTION:** Cylinder head camshaft journal caps and cylinder heads are numbered to be sure they are assembled in their original positions. Keep camshaft journal caps with the cylinder head from which they were removed. Do not mix with camshaft journal caps from another cylinder head.

Remove the camshaft journal caps. Loosen the bolts in several two-turn steps in the sequence shown. Remove the bolts.
60. **NOTE:** Remove the camshaft seals after the camshafts are removed.

**NOTE:** The oil control solenoid assembly and exhaust camshaft are removed as an assembly.

Remove the camshafts.

61. Remove the oil control solenoid and bushing from the exhaust camshaft.

62. **NOTE:** If valve tappets are being reused, the valve tappet must be installed in its original position or engine damage may occur.

Mark and remove the valve tappets.

63. **CAUTION:** The bolts are torque-to-yield. New bolts must be installed or possible engine damage can occur.

Remove the cylinder head, using the sequence shown:
- Discard the gasket.
- Discard the bolts.

64. If further disassembly of the cylinder head is required, refer to Cylinder Head Disassembly in this section.
65. Remove the oil pan.
   - Remove the bolts.
   - Remove the oil pan.
   - Clean sealing surfaces with a non-abrasive cleaner.

66. Remove the oil pump cover and screen.
   - Remove the bolts.
   - Remove the oil pump cover and screen.
   - Remove and discard the oil pump inlet tube gasket.

67. Remove the cylinder block cradle.

68. □ CAUTION: Use care to avoid damaging the crankshaft surface.

   Use the Seal Remover to remove the crankshaft front seal from the oil pump.

69. Remove the oil pump.
   - Remove the bolts.
   - Remove the oil pump.
   - Remove the oil pump to cylinder block gasket.

70. □ CAUTION: The connecting rods and connecting rod caps must be correctly oriented, with the interlocking tangs on the same side of the connecting rod or engine damage can occur. Mark the rod bearing caps and the connecting rods.

    □ CAUTION: The connecting rod bolts are torque-to-yield. Discard the connecting rod bolts.

   Remove the four connecting rod caps.
71. **NOTE:** If the connecting rod bearings are to be reused, each one must be identified so that it can be installed in its original location.

Remove the four upper and four lower connecting rod bearings.

72. **NOTE:** Before removing pistons, inspect the top of the cylinder bores. If necessary, remove the ridge or carbon deposits from each cylinder using a Cylinder Ridge Reamer, following manufacturer's instructions.

Using the special tool, remove the cylinder ridge.

73. Remove the four piston and connecting rod assemblies.

74. Remove the piston rings.

75. Remove the crankshaft main bearing caps.
   - Remove the bolts.
   - Remove the crankshaft main bearing caps.
   - Remove the lower crankshaft main bearings.

76. Remove the crankshaft.
77. Remove the upper crankshaft main bearings.

78. If required, remove all the pipe plugs and alignment dowels.