

CYL-04, 16V Cylinder Head and Head Gasket Removal and Installation

NOTE

Pictures in this procedure are taken from the Porsche factory shop manual. They will be replaced by better pictures when they become available.

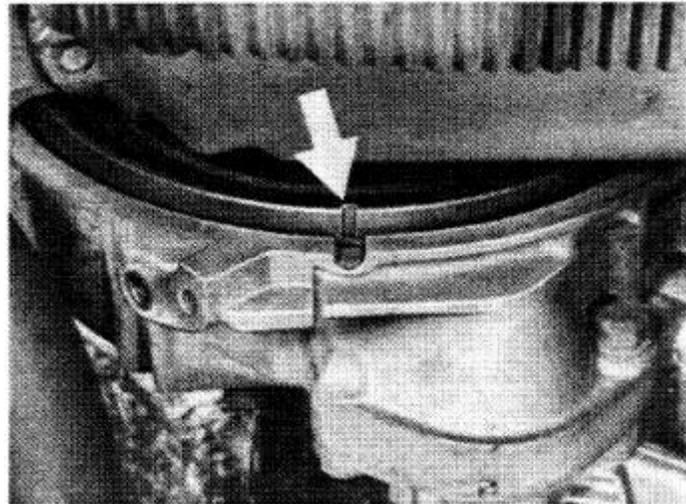
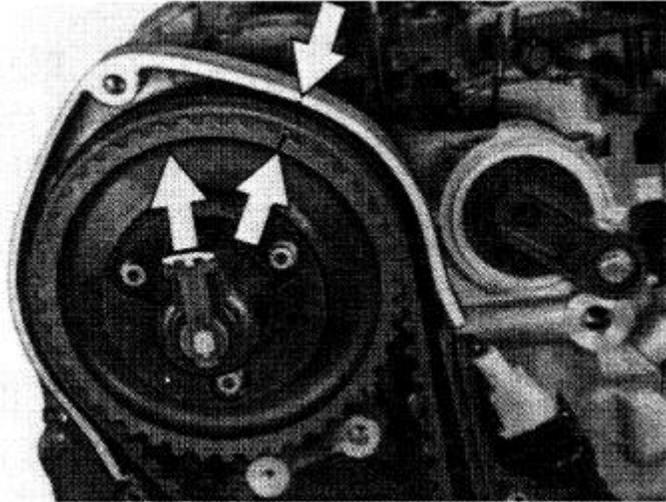
Tools

- Jack Stands or Ramps
- Metric Socket Set
- Metric Wrench Set
- Pry bar or Balance Shaft Pin Spanner (P 9200)
- Flat tip screwdriver
- Catch rags (for catching spilled fuel and coolant)
- Catch pan (for draining coolant system)

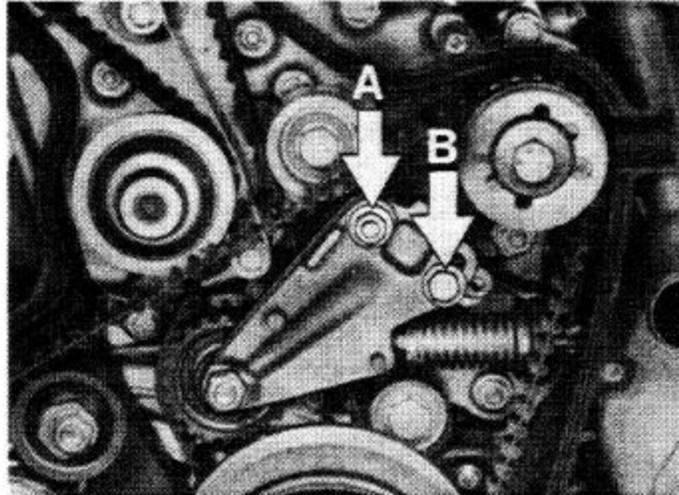
Procedure

1. Place the vehicle on jack stands.
2. Disconnect the battery negative lead.
3. Remove the breather hose from the air filter housing which attaches to the timing belt cover.
4. Remove the air filter assembly.
5. Remove the air flow sensor from the intake manifold.
6. Disconnect the throttle cable and remove cable holder and reversing roller assembly.
7. Remove the oil dipstick.
8. Remove the fuel rail cover and disconnect the fuel supply and return lines. Be careful when loosening the lines as the fuel rail may still be pressurized. Have catch rags handy to catch any fuel that spills.
9. Disconnect all hoses from the intake manifold.
10. Disconnect vacuum hoses from fuel damper and fuel pressure regulator. Disconnect the fuel dampener from the intake manifold.
11. Disconnect the idle actuator electrical connector.
12. Remove the fuel rail retaining bolts and pull the rail, with injectors attached, out of the intake manifold and lay to one side.
13. Disconnect the throttle position switch electrical connector.
14. Unbolt the intake manifold and remove from vehicle.
15. Underneath the vehicle, remove the belly pan.
16. Drain the coolant system to a drain pan by removing the drain plug at the bottom of the radiator.
17. Disconnect the exhaust manifolds at the lower exhaust manifold flanges.
18. Disconnect the plug wires at the spark plugs and remove the plug wires and distributor cap.

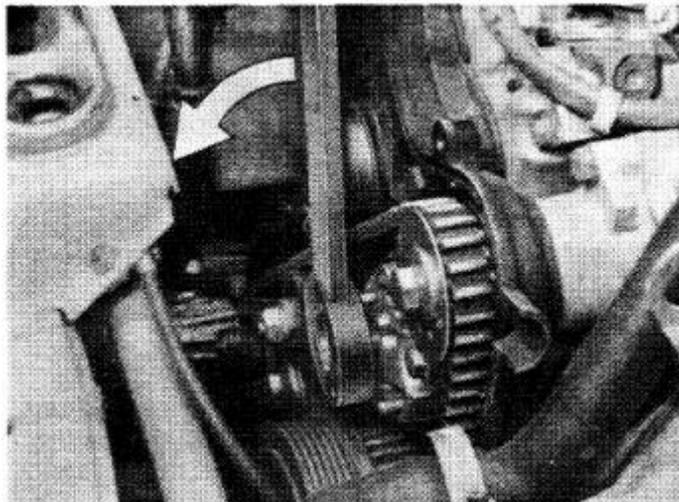
19. Remove the power steering pump and A/C compressor belts.
20. Remove the upper and lower timing belt covers and front distributor housing cover.
21. Roll the engine as necessary using a 24 mm (15/16") socket an ratchet or breaker bar on the crankshaft pulley bolt until the engine is at top dead center (TDC) on cylinder #1 as indicated by the alignment marks on the camshaft sprocket and distributor housing (also check that the alignment mark on the bottom of the flywheel is centered in the opening in the bottom of the clutch housing).



22. Remove the cylinder head valve cover (13 bolts with washers and seals).
23. Loosen the timing belt spring tensioner retaining bolts (A and B in drawing below).

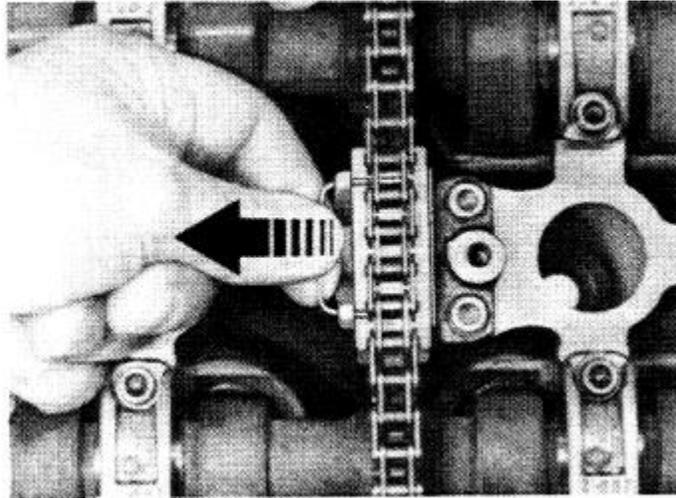


24. Compress the tensioner spring to until the belt is slack and tighten the tensioner retaining bolts (A and B). This is most easily done by inserting the Porsche special tool P 9200 (Balance Shaft Pin Spanner) into the holes on the front of the tensioner assembly and turning to compress the spring. However, it can be done using a pry bar (very awkward).



25. When the tension is removed from the timing belt, slide the belt off of the camshaft sprocket.
26. Remove the three bolts that hold the distributor rotor in place, remove the rotor, and install three M5 x 20 bolts in the cam shaft sprocket to hold it in place during removal of the retaining bolt.
27. Remove the center retaining bolt from the camshaft sprocket and remove the sprocket.
28. Remove the rear distributor housing cover.

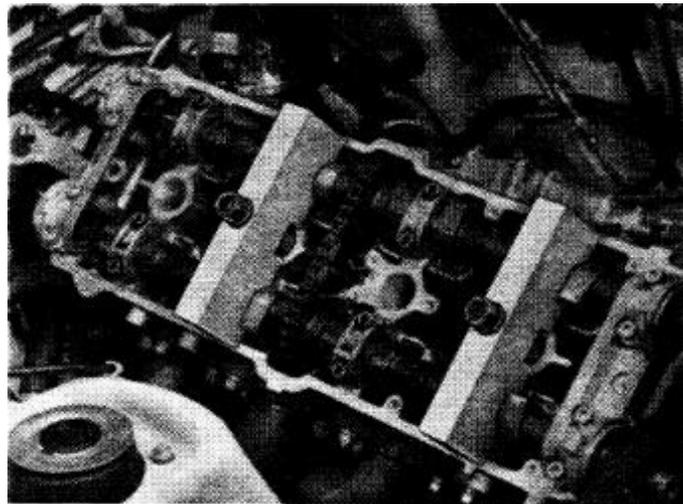
29. Compress the timing chain tensioner plunger and install a bent piece of wire into the plunger to hold it in the compressed position. The picture below shows the retaining wire. However, it is demonstrating removal of the wire after the tensioner is reinstalled.



30. Remove the bearing covers from cylinders 1 and 3.

NOTE

The factory shop manual calls for installing Special Tool 9226 (shown below) at this point. This consists of the bridges which hold the camshafts in place in their bearings (in place of the bearing covers at cylinders 1 and 3) while the front double bearing bridge is being removed. While these are useful, especially during camshaft installation, they are not essential.



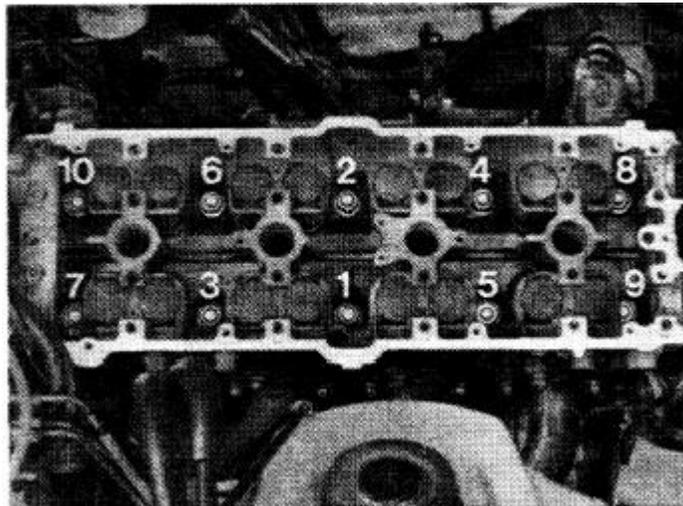
31. If Special Tool 9226 is to be used, install them at the locations where the bearing covers were removed at cylinders 1 and 3.
32. Remove the double bearing bridge and bearing covers at the front of cylinder head. If Special Tool 9226 is not used, remove the bearing bridge slowly and alternate from one side of the bridge to the other when loosening the bolts. The pressure from the valve springs will force the camshafts up out of the bearing shells. Alternating from one side to the other while loosening the bearing bridge allows the bearing bridge to rise evenly to prevent damage to the bridge.
33. If Special Tool 9226 was used, once the front bearing bridge is removed, loosen the retaining bolts for Special Tool 9226 alternating from one bridge to the other to allow the camshafts to rise evenly.
34. Remove the camshafts and timing chain by lifting them up and sliding them forward out of the rear double bearing bridge. The rear double bearing bridge need not be removed unless the camshaft bearings are to be replaced. Place the camshaft and timing chain aside in a location where they can not be damaged.
35. Loosen the cylinder head retaining nuts (located underneath the camshafts which are now removed) working from the front and back of the cylinder head toward the middle.
36. Lift the cylinder head out of the vehicle. Remember that the exhaust manifolds are still attached to the cylinder head so this may be a little awkward.
37. If the head gasket is to be replaced, remove the old head gasket and discard.

Installation

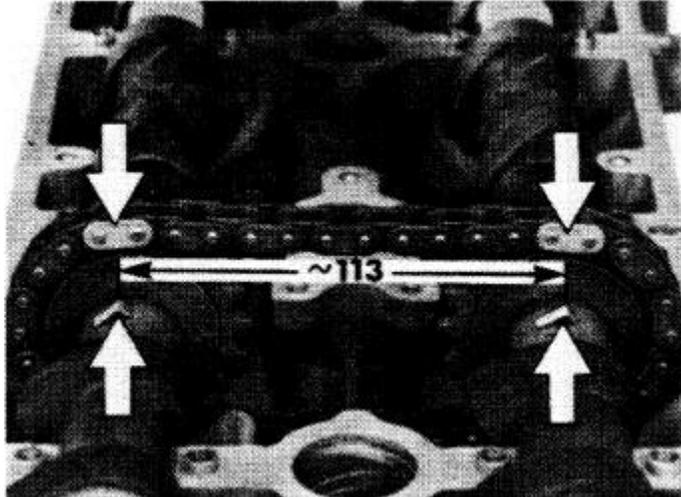
1. Clean the mating surfaces on both the cylinder head and engine block.
2. Place a new head gasket on the engine block making sure it is aligned in the correct orientation.
3. Place the cylinder head on the block and install the retaining nuts finger tight. DO NOT apply lubricant to the cylinder head nuts and washers. Apply a light film of engine oil to the head stud thread prior to installation of the fasteners.

4. Torque the cylinder head nuts using the torque specs listed below which apply to your vehicle and using the torque sequence shown in the diagram below.

Vehicle	Engine Designator	Torque Specs
944S (87-88)	M44 40	Step 1: 20 Nm (15 ft-lbs)
		Step 2: 90° angle
		Step 3: 90° angle
944 S2 (89-91), 968 (92-93), 968 CS (93)	M44 41,43,44	Step 1: 20 Nm (15 ft-lbs)
		Step 2: 60° angle
		Step 3: 90° angle



5. Install the camshafts into the cylinder head as follows:
 - a. Rotate the engine clockwise until it is approximately 45° before TDC on cylinder #1. The engine rotate more freely if the spark plugs have been removed.
 - b. Place the intake and exhaust camshafts in the timing chain so that the cast lugs on the camshafts align with the marked links of the timing chain (see picture below).



- c. Apply oil or assembly lubricant to the camshaft bearing journals and camshafts with chain into the cylinder head. Be careful to maintain the chain to camshaft alignment.
- d. Once installed, the distance between the marks on the intake and exhaust camshafts should be 7 outer chain lengths apart or approximately 113 mm as shown in the picture above.
- e. If Special Tool 9226 is to be used, install the tools and alternately tighten them to seat the intake and exhaust camshaft into their bearing journals.

NOTE

Bearing bridges and bearing covers are machined to be installed in a specific location on the cylinder head. During installation, be sure to match the identifications codes stamped on the bridges and covers to those stamped on the cylinder head.

- f. Install the double bearing bridge assembly at the front of the cylinder head and tighten the bearing bridge fasteners to 20 Nm. If Special Tool 9226 is not used, alternate from one side of the bearing bridge to the other when tightening the fasteners to seat the bearing bridge evenly as it is tightened.
- g. Remove Special Tool 9226 if used.
- h. Install the bearing covers for cylinders 1 and 3 and tighten the cover fasteners to 20 Nm.
- i. Install new seal rings at the front and rear bearing bridge assemblies. Apply a thin coating of Loctite 574 to the sealing surfaces of the bearing bridges prior to installation.