

2007 Porsche Boxster

ENGINE Cylinder head, valve drive - Boxster And Cayman

ENGINE

Cylinder head, valve drive - Boxster And Cayman

15 05 02 CHECKING CAMSHAFT TIMING - ENGINE INSTALLED - AS OF MY 2005 (BOXSTER, BOXSTER RHD, BOXSTER S, BOXSTER S RHD)

TOOLS

Designation	Type	Number	Explanation	
locating pins	special tool	P 9595/1		
adjusting gauge	special tool	P 9686		

PRELIMINARY WORK FOR CHECKING CAMSHAFT TIMING

Preliminary work for checking camshaft timing

1. Remove rear wall cover. Refer to **55 59 19 Removing and installing rear wall cover - as of MY 2005 (All Models)** .

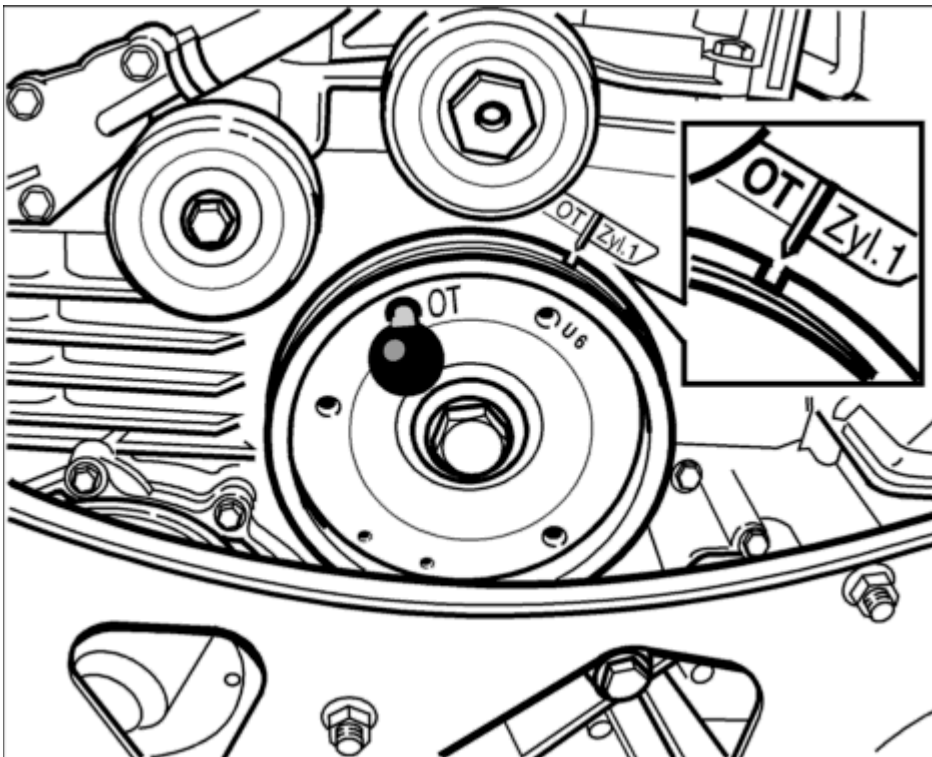


Fig. 1: TDC marking

Courtesy of PORSCHE OF NORTH AMERICA, INC.

2. Turn the engine clockwise at the crankshaft pulley to the TDC marking of cylinder 1. Fix with special tool **locating pins P 9595/1** (short locating pin).

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3. Place jacks under the vehicle at the prescribed jacking points --> **40 LIFTING THE VEHICLE - AS OF MY 2005 (ALL MODELS)** .
4. Remove rear underbody cover. Refer to **51 94 19 Removing and installing cover for rear underbody - as of MY 2005 (All Models)** .
5. Drain engine oil. Refer to **17 01 55 Engine oil and oil filter change - as of MY 2005 (All Models)** .

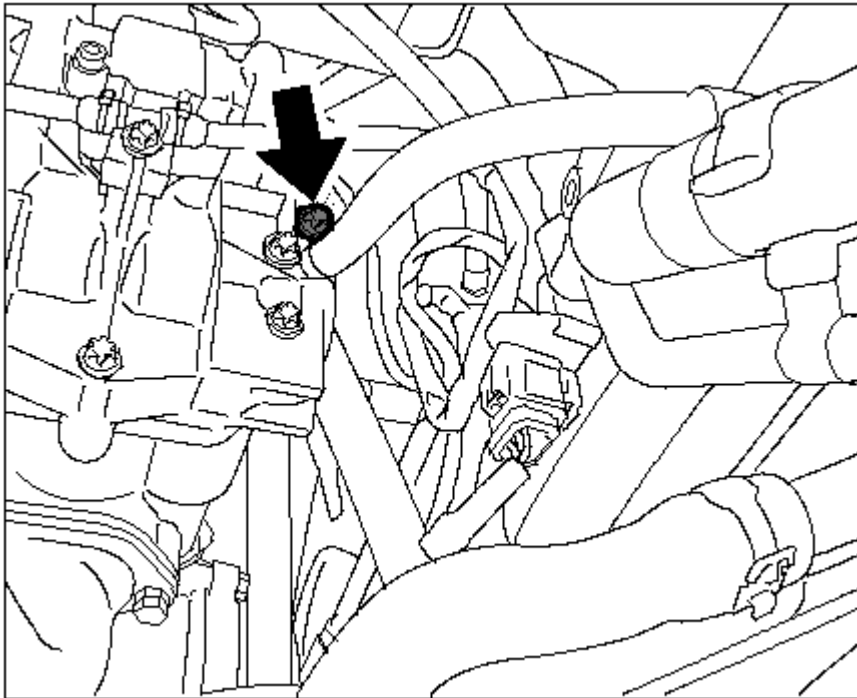


Fig. 2: Engine ground strap

Courtesy of PORSCHE OF NORTH AMERICA, INC.

6. Remove ground strap by unscrewing the Torx screw (M8 x 30) -**arrow-** . See **Fig. 2**.

CHECKING CAMSHAFT TIMING

Checking camshaft timing

NOTE: Do not turn engine crankshaft against the rolling direction of the engine. Ensure absolute cleanliness when working on the open engine. Make sure that no dirt gets into the engine.

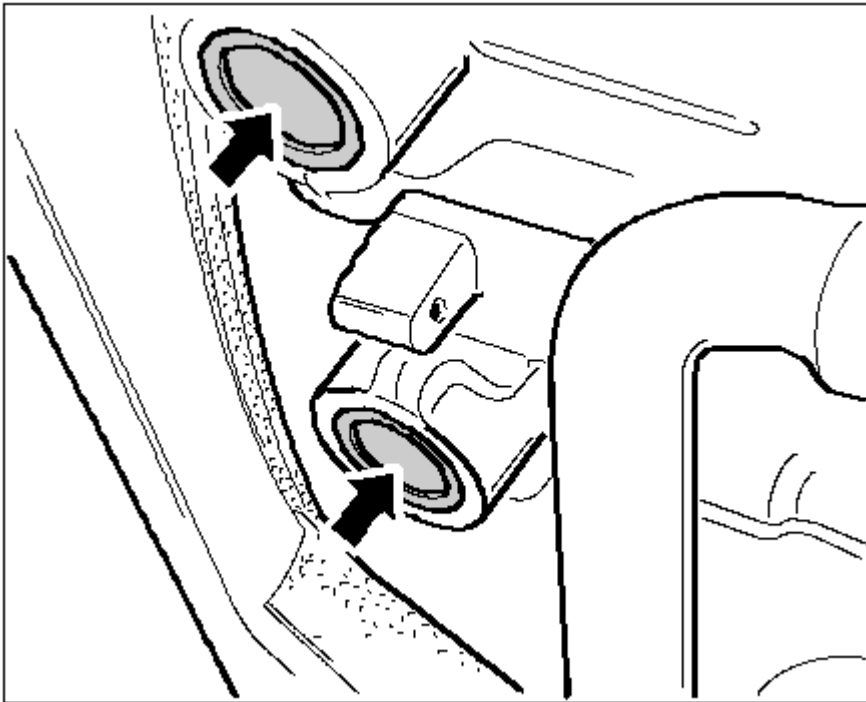


Fig. 3: Cap

Courtesy of PORSCHE OF NORTH AMERICA, INC.

1. Remove all four green caps on the camshaft housing covers on both cylinder banks. To do this, press a small screwdriver into the center of the piercing point of each cap -arrows- and lever off the caps. See **Fig. 3**.

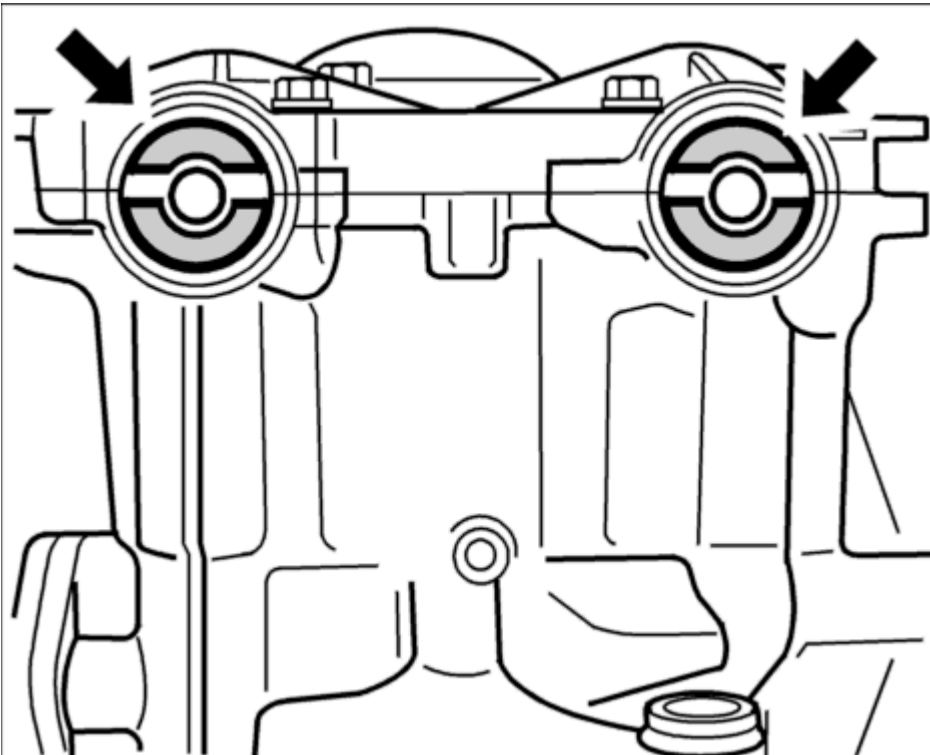
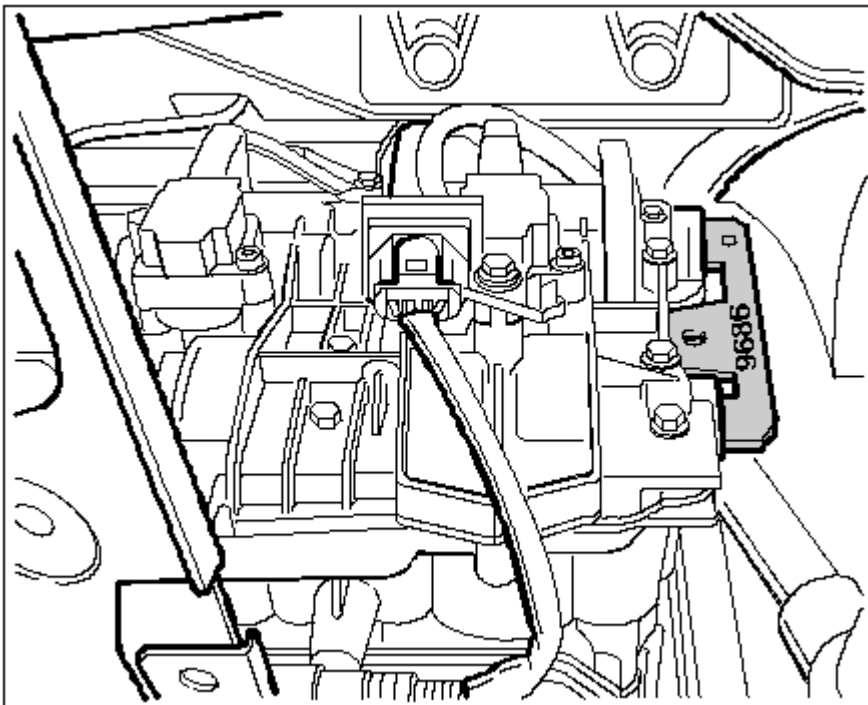


Fig. 4: Position of camshafts

Courtesy of PORSCHE OF NORTH AMERICA, INC.

2. Check the cylinder side that is at the overlapping TDC first (the smaller circular cutout at the milled grooves of the inlet and exhaust camshafts is facing the cylinder head cover) using an **adjusting gauge P 9686**. Then turn the engine a further 360° (as described above) and check the other cylinder side as well.

**Fig. 5: Camshaft adjusting gauge**

Courtesy of PORSCHE OF NORTH AMERICA, INC.

Align camshafts.

SUBSEQUENT WORK FOR CHECKING CAMSHAFT TIMING

Subsequent work for checking camshaft timing

1. Fit two new green caps on the camshaft housing cover.

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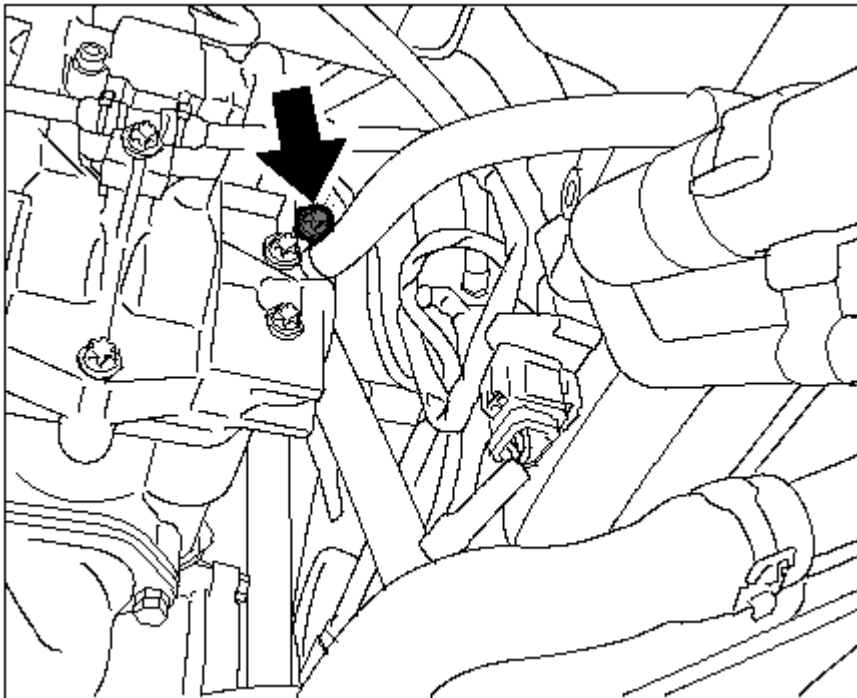


Fig. 6: Engine ground strap

Courtesy of PORSCHE OF NORTH AMERICA, INC.

2. Fit ground strap by inserting and tightening the Torx screw (M8 x 30) -arrow- . --> **Tightening torque: 17 ftlb.** . See **Fig. 6**.
3. Install rear underbody cover. Refer to **51 94 19 Removing and installing cover for rear underbody - as of MY 2005 (All Models)** .
4. Fill in engine oil. Refer to **17 01 55 Engine oil and oil filter change - as of MY 2005 (All Models)** .
5. Remove special tool **locating pins P 9595/1** (short locating pin).
6. Install rear wall cover. Refer to **55 59 19 Removing and installing rear wall cover - as of MY 2005 (All Models)** .

15 05 20 REMOVING AND INSTALLING CAMSHAFT - AS OF MY 2005 (BOXSTER, BOXSTER RHD)

TOOLS

Designation	Type	Number	Explanation	
cover for dust protection when fitting the engine	special tool	NR.165		
locating pin	special tool	P 9595/1		
retaining tool	special tool	P 9685		

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adjusting gauge

special tool

P 9686

CAMSHAFT DESIGNATION M96.26

Camshaft designation M96.26

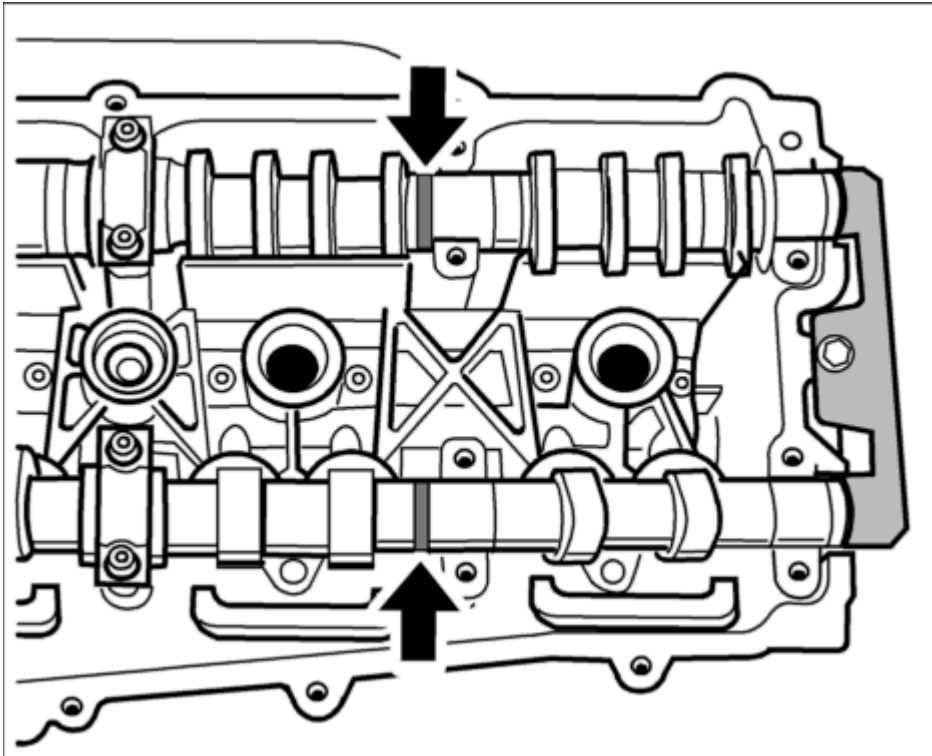


Fig. 7: Position of camshaft designation

Courtesy of PORSCHE OF NORTH AMERICA, INC.

Position of lettering: -arrows- . See **Fig. 7**.

Camshafts for cylinders 1 - 3

- Inlet camshaft: 996.105.049.00 3,2 IN 1-3
- Exhaust camshaft: 996.105.063.00 3,2 EX 1-3

Camshafts for cylinders 4 -6:

- Inlet camshaft: 996.105.050.00 3,2 IN 4-6
- Exhaust camshaft: 987.105.064.26 3,2 EX 4-6 (with aluminum plugs)

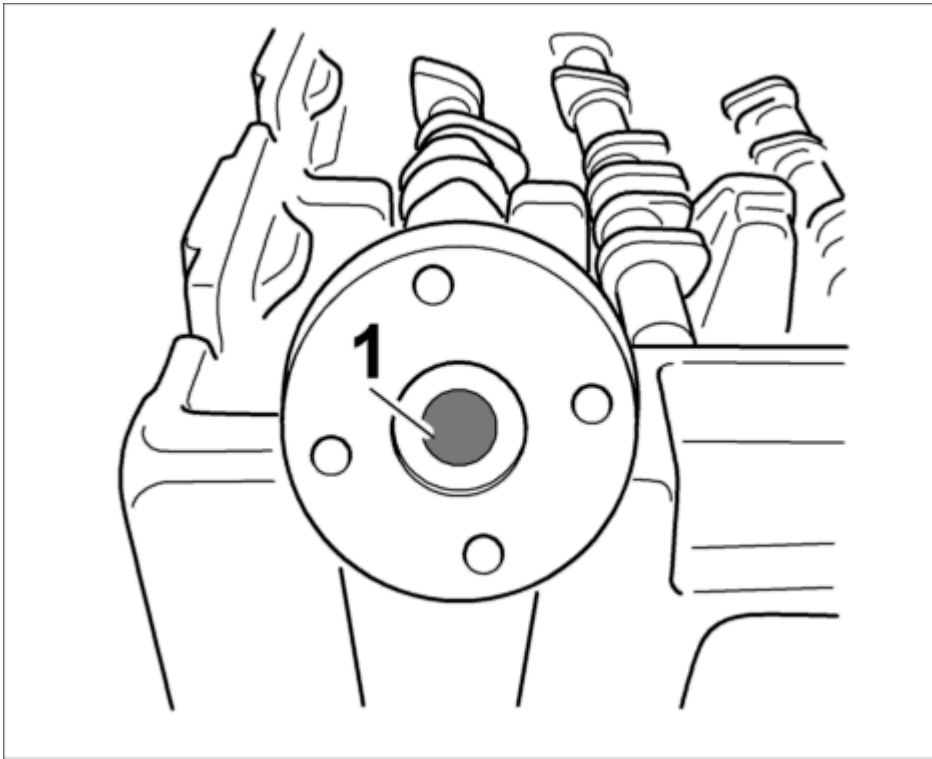


Fig. 8: aluminum plugs in exhaust camshaft 4 - 6

Courtesy of PORSCHE OF NORTH AMERICA, INC.

Additional identifying feature for exhaust camshaft 4 - 6: aluminum plugs with lubrication bore **-1-** for tandem pump. See **Fig. 8**.

ALLOCATION OF INLET CAMSHAFT ADJUSTMENT DEVICE

Allocation of inlet camshaft adjustment device

Camshaft adjustment device on inlet camshaft, cylinder bank 1 - 3

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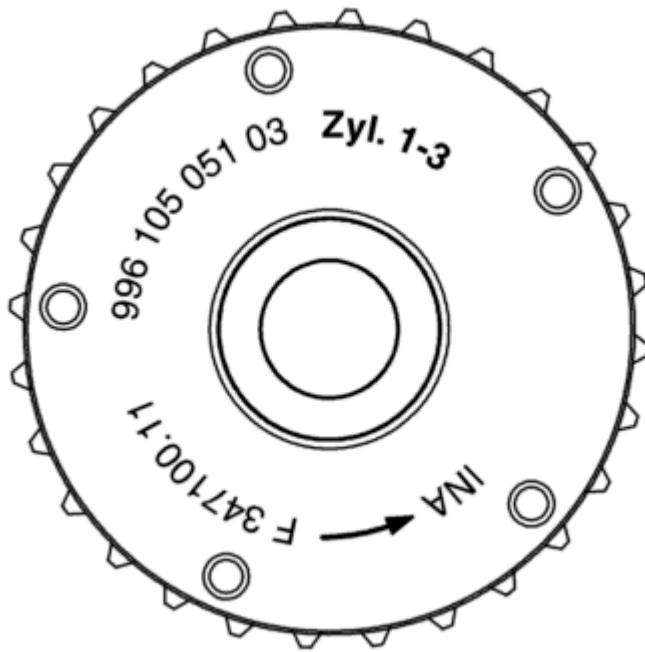


Fig. 9: Designation of adjuster 1 - 3

Courtesy of PORSCHE OF NORTH AMERICA, INC.

NOTE:

- ***Side 1 - 3: the arrow should be attached anti-clockwise***

- Designation, side 1 - 3:

- Part number, cylinder bank, manufacturer information, direction of rotation of engine (arrow), production date.

Camshaft adjustment device on inlet camshaft, cylinder bank 4 - 6

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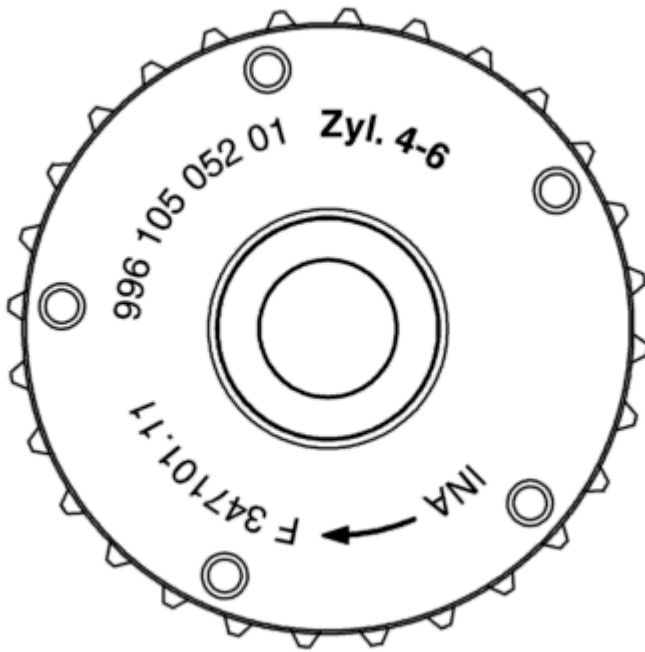


Fig. 10: Designation of adjuster 4 -6

Courtesy of PORSCHE OF NORTH AMERICA, INC.

NOTE:

- ***Side 4 - 6: the arrow should be attached clockwise***

- Designation, side 4 - 6:

- Part number, cylinder bank, manufacturer information, direction of rotation of engine (arrow), production date.

ALLOCATION OF CHAIN TENSIONERS

Allocation of chain tensioners

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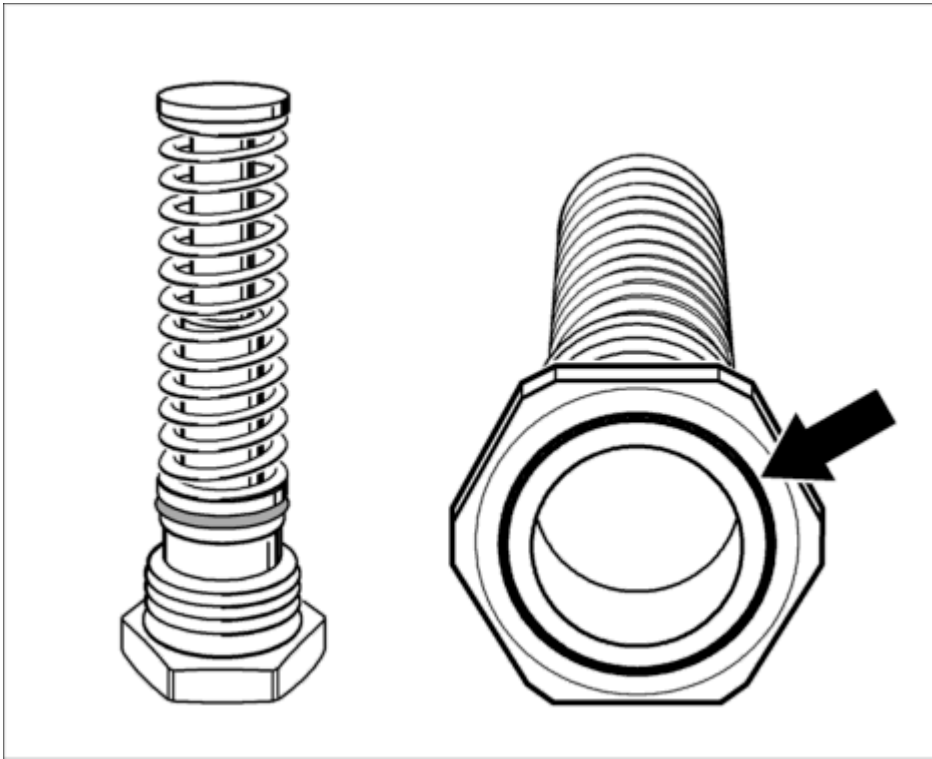


Fig. 11: Primary chain tensioner

Courtesy of PORSCHE OF NORTH AMERICA, INC.

- Primary chain tensioner on crankcase (oil filter area), identification: **one ring -Arrow-** . See **Fig. 11**.

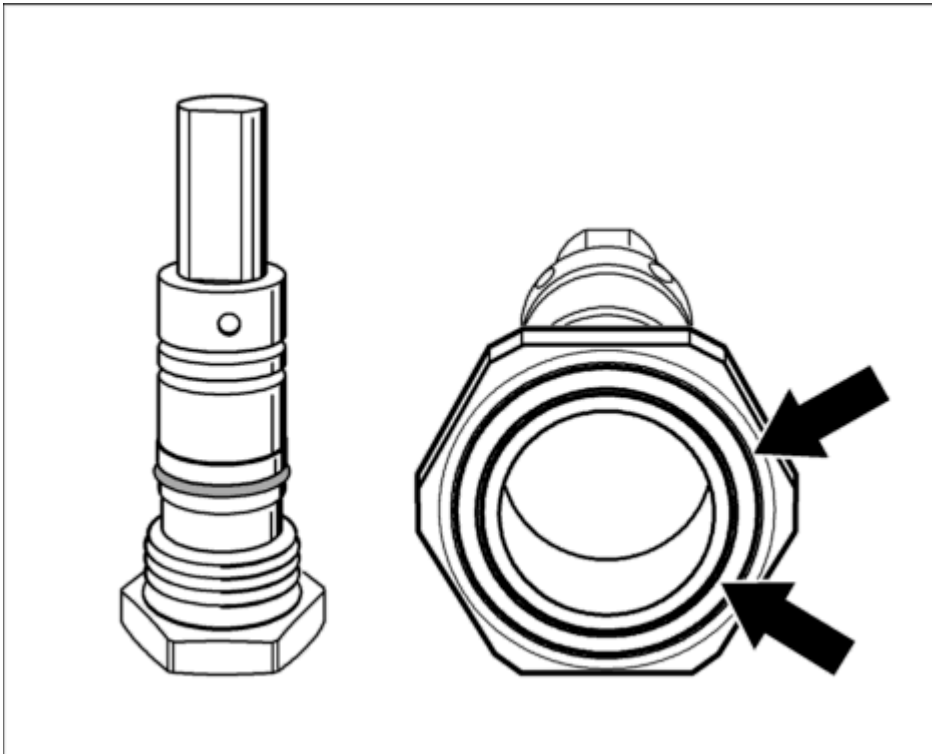
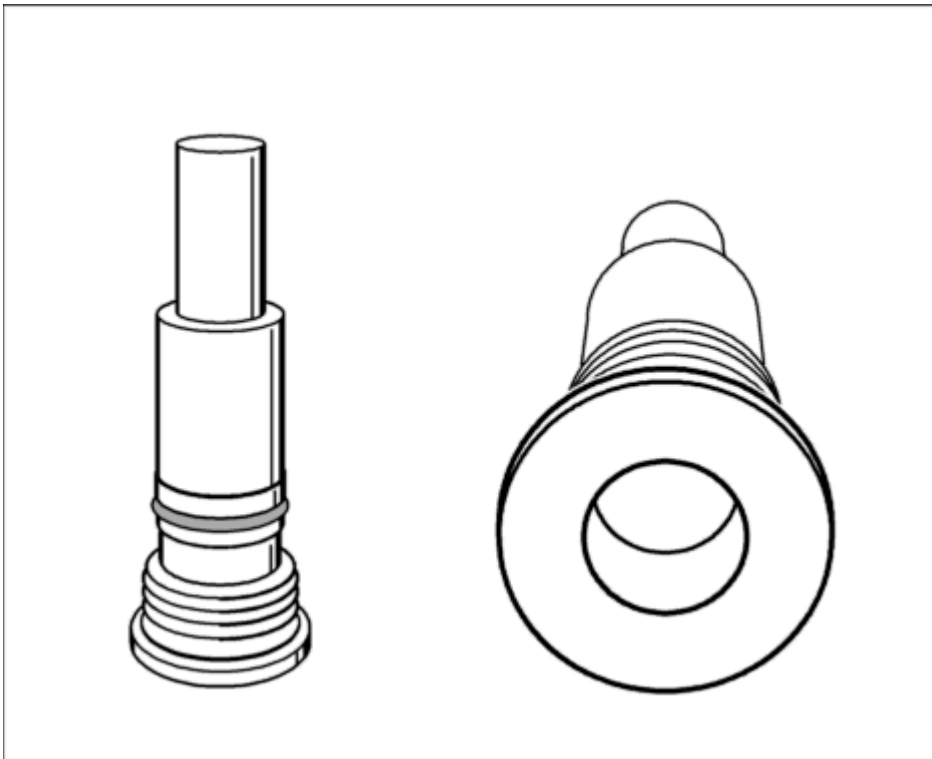


Fig. 12: Chain tensioner, cylinders 1 - 3

Courtesy of PORSCHE OF NORTH AMERICA, INC.

- Chain tensioner on cylinder head, cylinder bank 1 - 3, identification: **two rings -Arrows-** . See **Fig. 12**.

**Fig. 13: Chain tensioner 4 - 6**

Courtesy of PORSCHE OF NORTH AMERICA, INC.

- Chain tensioner on cylinder head, cylinder bank 4 - 6, no identification.

PRELIMINARY WORK FOR REMOVING CAMSHAFTS**Preliminary work for removing camshafts**

1. Remove engine. Refer to **10 01 19 Removing and installing engine - as of MY 2005 (Boxster, Boxster RHD, Boxster S, Boxster S RHD)** .

2. For disassembling cylinder bank 1 - 3, undo the ground cable on the cylinder head by unscrewing a Torx screw M8 and removing the cable. Unplug the cable plug for the oil pressure switch.

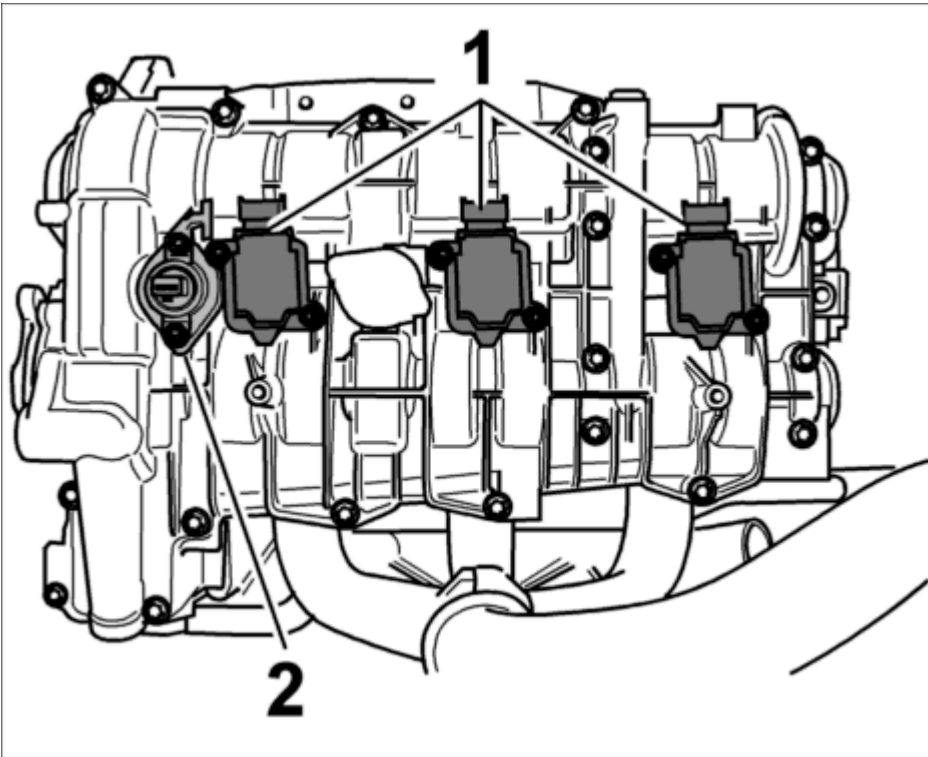


Fig. 14: Hydraulic valve for camshaft adjustment and ignition coils
Courtesy of PORSCHE OF NORTH AMERICA, INC.

3. Remove ignition coils -1-. In each case, unscrew two M6 x 25 Torx socket screws and pull the ignition coil out of the spark-plug recess.

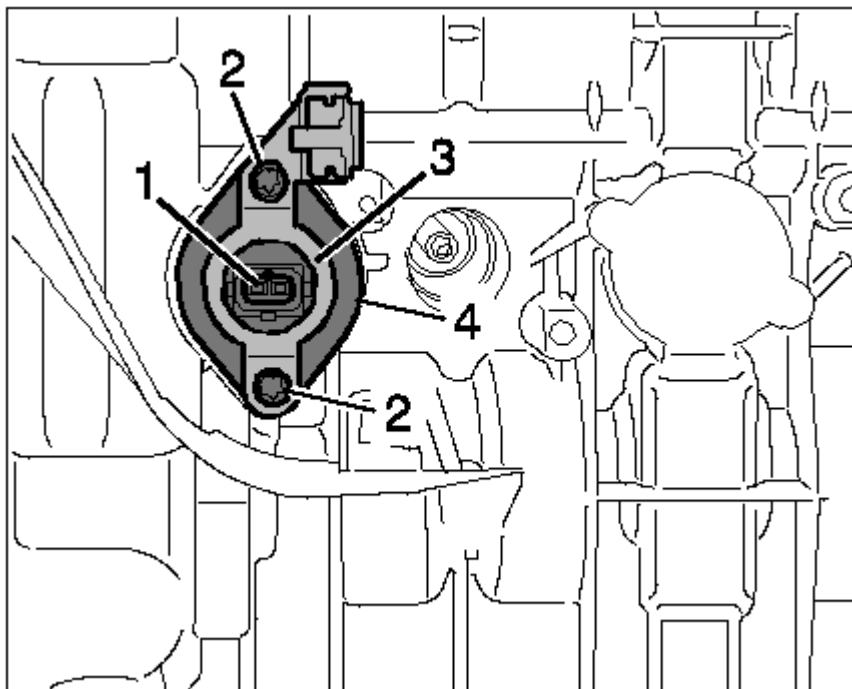
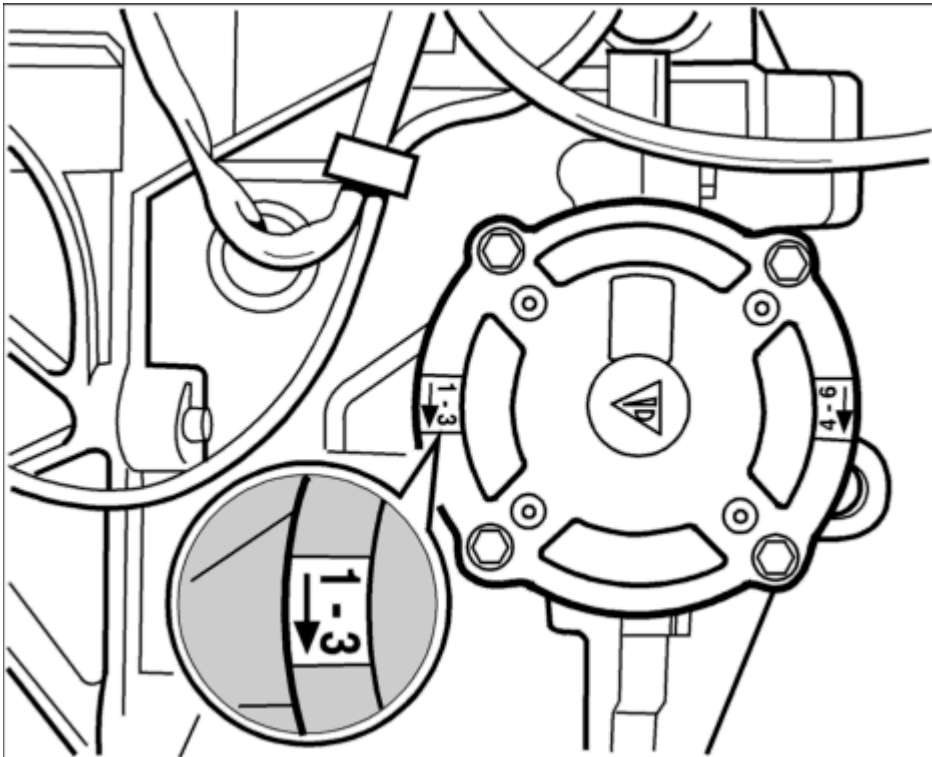


Fig. 15: Solenoid hydraulic valve for camshaft timing

Courtesy of PORSCHE OF NORTH AMERICA, INC.

4. Remove solenoid hydraulic valve -1- (for camshaft timing) --> **153719 Removing and installing solenoid hydraulic valve for camshaft timing - chapter on "Removing"**. See **Fig. 15**.
5. Remove spark plugs. Refer to **28 70 20 Removing and fitting spark plugs - as of MY 2005 (All Models)** .

**Fig. 16: Oil suction pump for cylinders 1 - 3**

Courtesy of PORSCHE OF NORTH AMERICA, INC.

6. Remove oil suction pump for cylinders 1 - 3. Unscrew four Torx screws M6 x 20 (micro-self-locking), remove oil suction pump, and replace O-ring and screws.

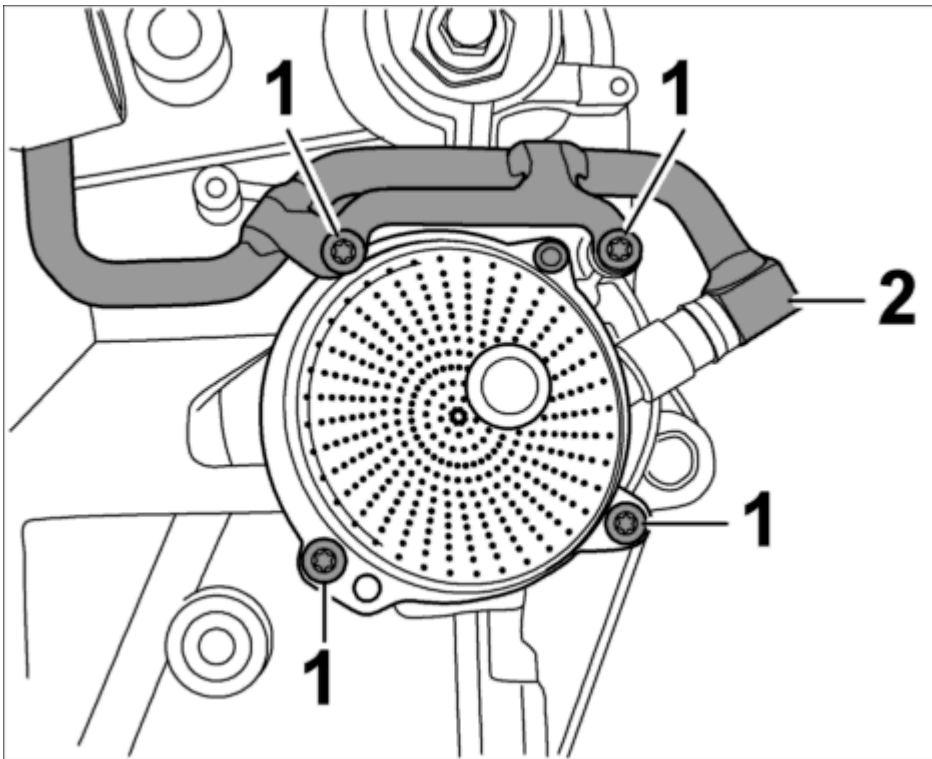


Fig. 17: Tandem pump side 4 - 6

Courtesy of PORSCHE OF NORTH AMERICA, INC.

7. Remove tandem pump for cylinders 4 - 6. Unscrew four Torx screws M6 (micro-self-locking) -1- . Pull off the vacuum line on pump -2- . Remove pump and replace O-rings and micro-self-locking screws. See **Fig. 17**.

REMOVING CAMSHAFT - ENGINE REMOVED

Removing camshaft - engine removed

CAUTION: Risk of damage due to particles of dirt.

- Oil bores/oil ducts can become blocked up.

--> When working on the engine, absolute cleanliness is essential.

--> Lay removed engine parts on a clean base and cover them without fail.

--> Use the **cover for dust protection when fitting the engine NR.165** on the engine assembly support.

1. Remove the plastic caps on the cylinder head. Press a small screwdriver into the center of the piercing point of each cap and lever out the cap.

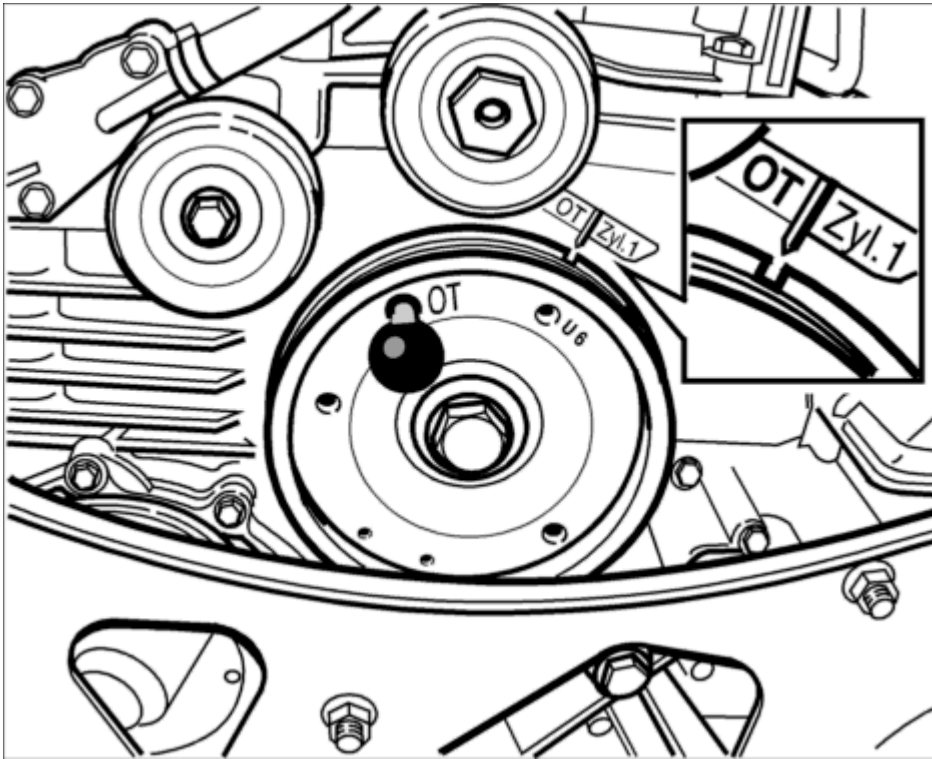


Fig. 18: TDC marking on pulley

Courtesy of PORSCHE OF NORTH AMERICA, INC.

2. **Disassembling cylinder bank 1 - 3** Turn crankshaft at the pulley/vibration balancer **clockwise** to the overlapping TDC of cylinder 1. **Disassembling cylinder bank 4 -6** Turn crankshaft to the TDC for cylinder 4. Using a **locating pin P 9595/1** fix the pulley or vibration balancer.

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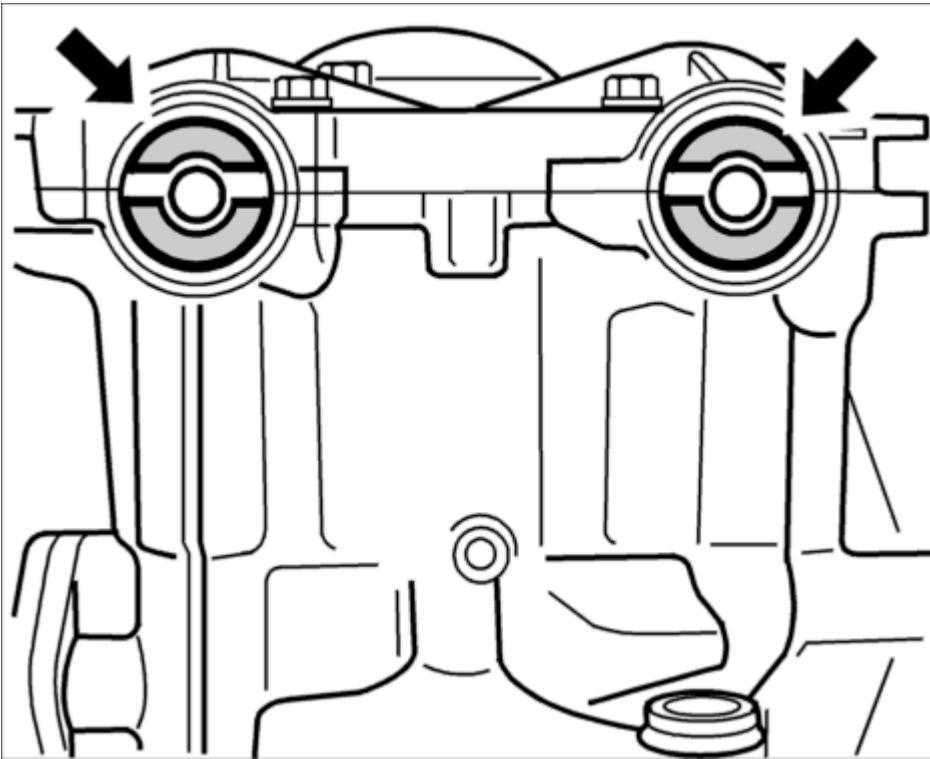


Fig. 19: Position of the camshafts in overlapping TDC of cylinders 1 or 4
Courtesy of PORSCHE OF NORTH AMERICA, INC.

3. If the camshafts of cylinder bank 1 - 3 are removed, the smaller circular cut-outs at the grooves of the inlet and outlet camshafts **-arrows-** of **cylinder 1** must point to the cylinder head cover. For cylinder bank 4 - 6 the corresponding position is then on **cylinder 4** . Check the position using the **adjusting gauge P 9686**. See **Fig. 19**.

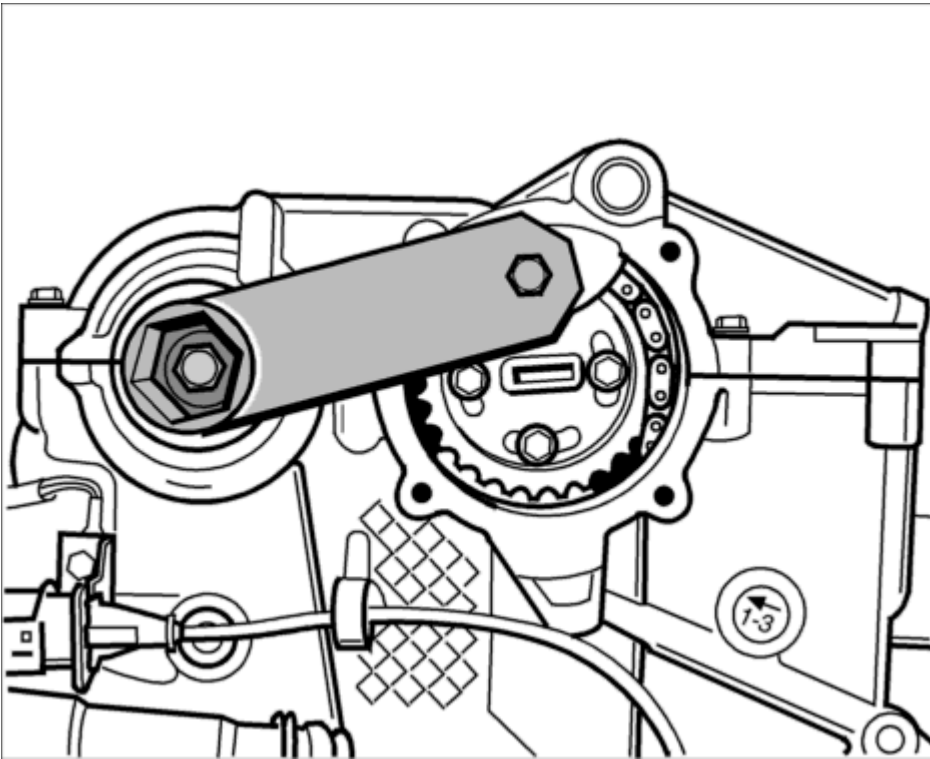


Fig. 20: Unscrew the central screw on the camshaft adjuster.

Courtesy of PORSCHE OF NORTH AMERICA, INC.

NOTE:

- ***Before disassembling the cylinder head cover, it is essential to unscrew the central screw on the camshaft adjustment device.***

4. Unscrew the central screw on the camshaft adjustment device. Position **retaining tool P 9685** on the hexagon of the adapter and place the contact block as a counter on the fitting bore of the cylinder head cover for the oil suction pump; if necessary, position the contact block by undoing and tightening the screw. If the special tool cannot be positioned on the hexagon of the adapter in this way, the engine must be turned further in the direction of rotation at the belt pulley of the crankshaft until the contact block comes into contact with the central screw of the cylinder head cover, ready for unscrewing. Unscrew the central screw.

5. Remove cylinder head cover --> **158220 Removing and installing cylinder head cover - chapter on "Removing"**.

6. Release the four Torx screws M6 x 16 on the sprocket of the respective exhaust camshaft. Do not remove the sprocket.

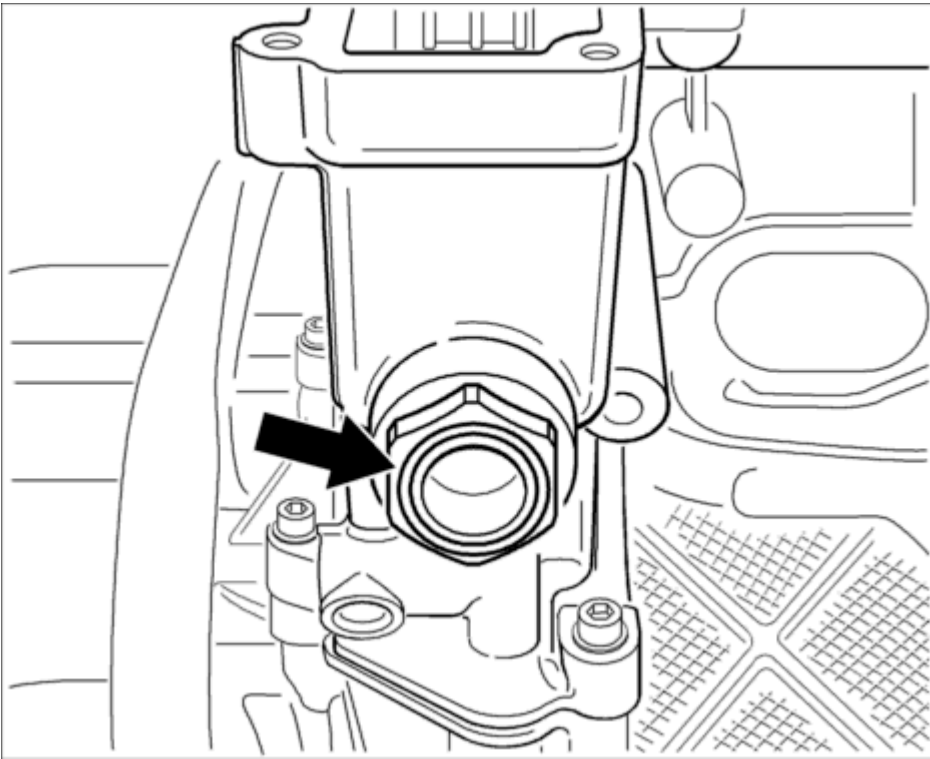


Fig. 21: Chain tensioner, cylinders 1 - 3

Courtesy of PORSCHE OF NORTH AMERICA, INC.

7. Remove chain tensioner for cylinders 1 - 3 or 4 - 6.

Cylinder side 4-6:

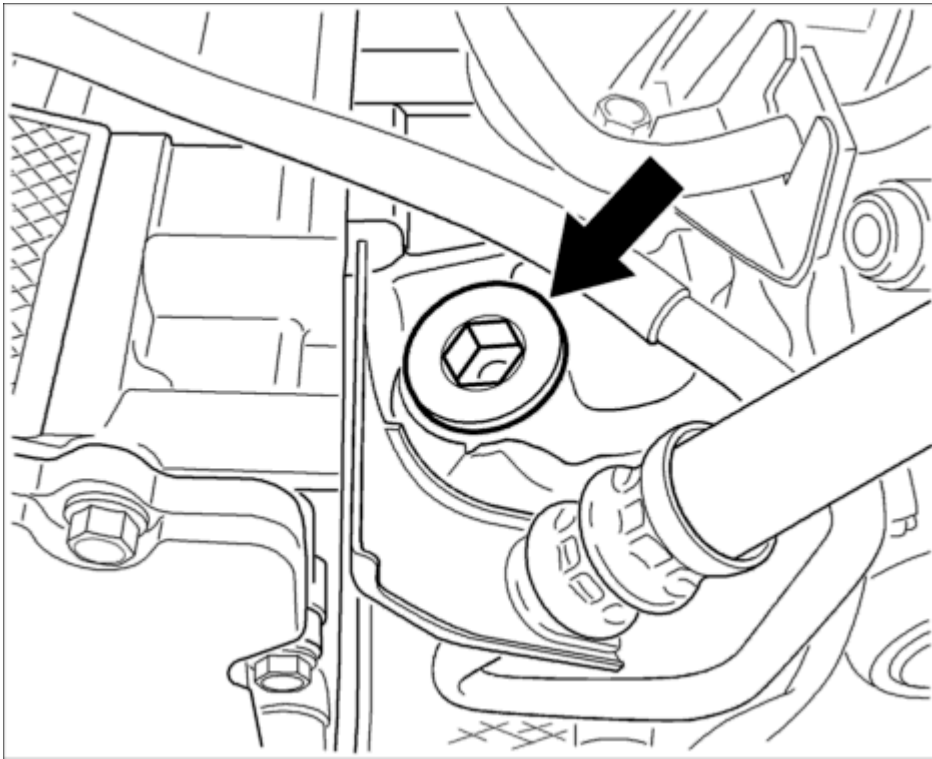


Fig. 22: Chain tensioner, cylinders 4 - 6

Courtesy of PORSCHE OF NORTH AMERICA, INC.

8. Remove the chain tensioner for cylinders 4 - 6.
9. Unscrew the M6 guide rail screw on the pulley side (hexagon socket a/f 5).
10. Turn the engine at the assembly support so that cylinder bank to be worked on stands vertically upwards.
11. Unscrew four Torx screws for exhaust camshaft sprocket. Lift timing chain off sprocket and remove the sprocket. Lay timing chain on the mounting tab for the sprocket.
12. Remove the four camshaft thrust bearings and the guide rail. Unscrew eight Torx screws, six M6 x 35, two M6 x 40 (screws for guide rail). Lift the thrust bearing and the guide rail carefully off the mounting points or timing chain.
13. Remove the camshafts. Remove exhaust camshaft, lift timing chain off the camshaft adjuster of the inlet camshaft and remove the camshaft. Lay the timing chain in the chain housing in the cylinder head.

INSTALLING CAMSHAFT - ENGINE REMOVED

Installing camshaft - engine removed

CAUTION: Risk of damage due to particles of dirt.

- **Oil bores/oil ducts can become blocked up.**

--> When working on the engine, absolute cleanliness is essential.

--> Lay removed engine parts on a clean base and cover them without fail.

--> Use the **cover for dust protection when fitting the engine NR.165** on the engine assembly support.

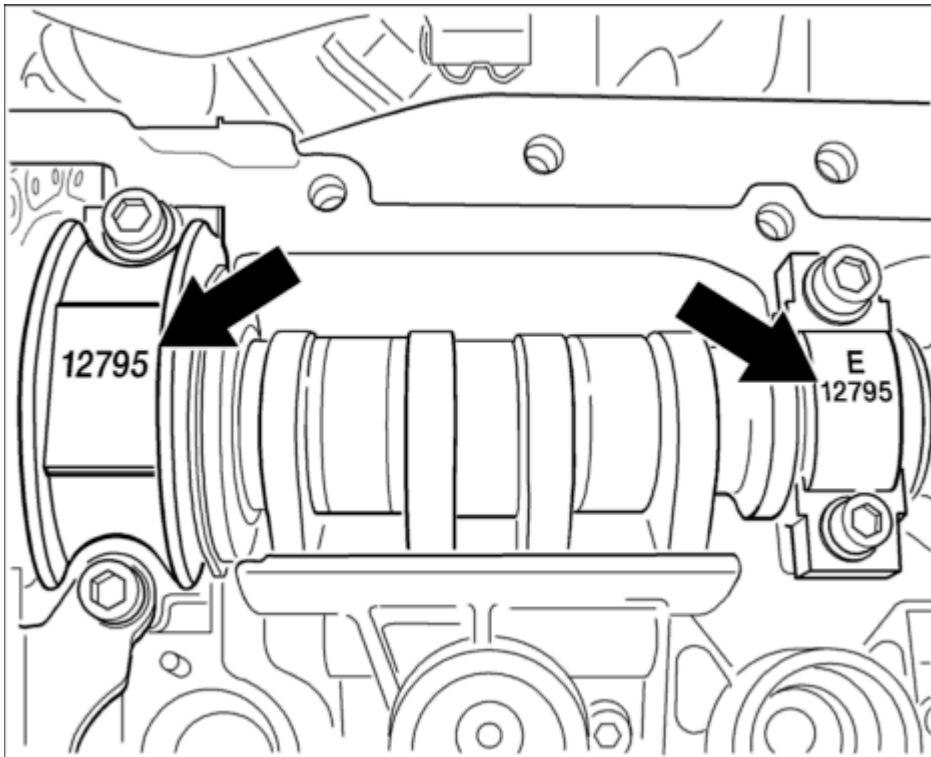


Fig. 23: Identification of camshaft housing:

Courtesy of PORSCHE OF NORTH AMERICA, INC.

Identification of housings of camshafts:

- **Inlet camshaft:**
- **Thrust bearing:** 'E' and matching number on cylinder head/cylinder head cover
- **Housing of bearing sleeve:** only matching number
- **Outlet camshaft:**
- **Thrust bearing on sprocket:** '1A' and matching number on cylinder head/cylinder head cover
- **2nd Thrust bearing:** '2A' and matching number on cylinder head/cylinder head cover

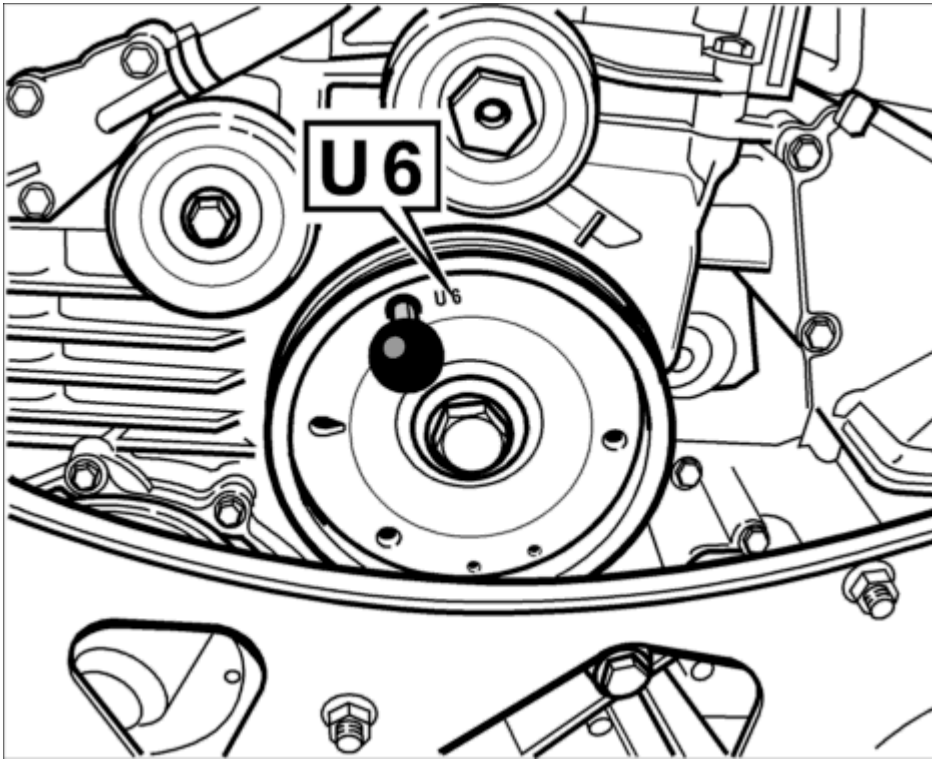


Fig. 24: Pulley fixed at 60° before TDC

Courtesy of PORSCHE OF NORTH AMERICA, INC.

1. To remove the play from the timing chain drive, turn the crankshaft by means of the pulley or vibration balancer **clockwise (running direction of engine to 60° before TDC : marking U6 on pulley or vibration balancer coincides with fixing bore in crankcase** . Fix with **locating pin P 9595/1**.

Assembly of cylinder bank 4 - 6

2. Turn the engine on the assembly support until cylinder bank 4 - 6 stands vertically upwards.
3. Oil the bearing surfaces of the camshafts with new engine oil.

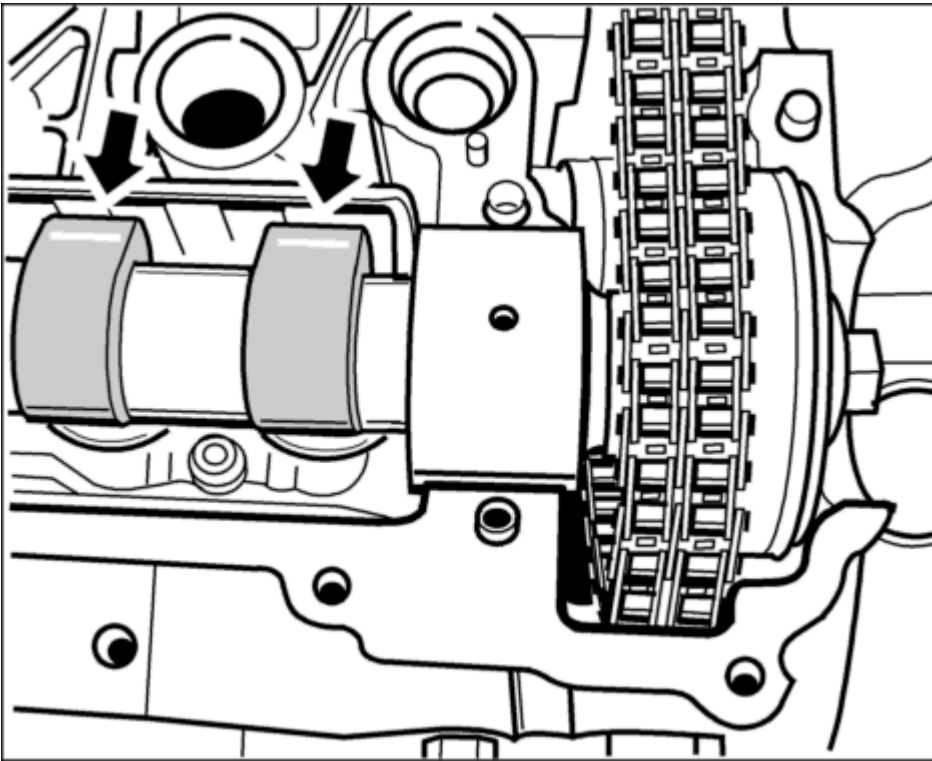


Fig. 25: Cams of cylinder 4 pointing towards the bulkhead

Courtesy of PORSCHE OF NORTH AMERICA, INC.

4. Insert inlet camshaft 4-6. Pull the timing chain out of the chain housing of the cylinder head with a welding wire and position on the ring gear of the camshaft adjuster, at the same time inserting the camshaft at overlapping TDC of cylinder 4 (the cams of cylinder 4 point towards the bulkhead of the flat-base tappet housing -arrows-).

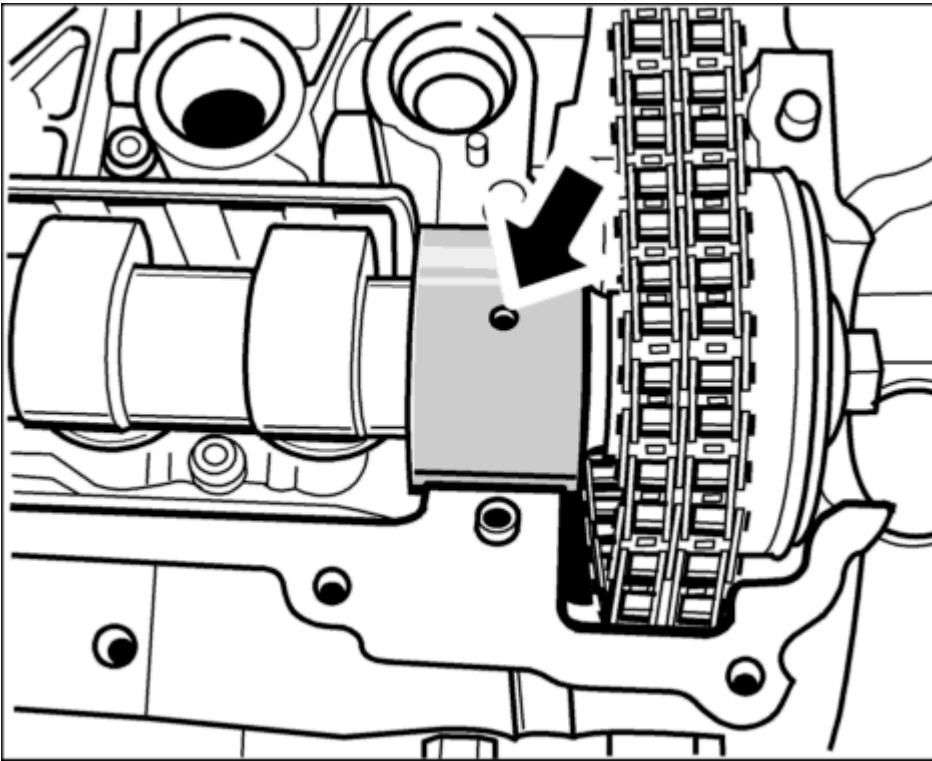


Fig. 26: Position of bearing sleeve for inlet camshaft
Courtesy of PORSCHE OF NORTH AMERICA, INC.

NOTE:

- ***Make sure that the bearing sleeve on the inlet camshaft is positioned correctly.***

5. The bearing sleeve of the inlet camshaft must be positioned so that the centrally bored blind hole points vertically upwards **-arrow-** (the rib of the cylinder head should also be at the center in relation to the bearing sleeve). In this position, the dowel pin in the bearing bore of the cylinder head will fit precisely into the opposite off-center blind hole bore. Any other bores are through-holes for guiding the oil.

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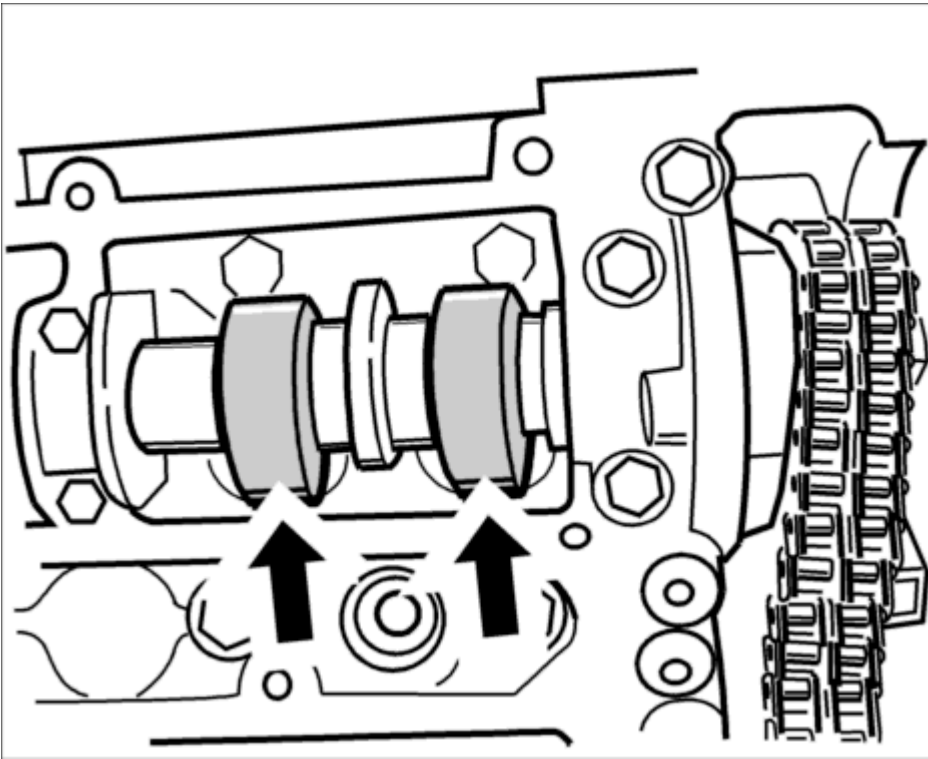


Fig. 27: Exhaust camshaft 4 - 6

Courtesy of PORSCHE OF NORTH AMERICA, INC.

6. Insert exhaust camshaft 4-6. Lay the timing chain on the flange for the sprocket, then insert the camshaft at overlapping TDC of cylinder 4 (the outlet cams of cylinder 4 point towards the cams of the inlet camshaft - **arrows-**). See **Fig. 27**.

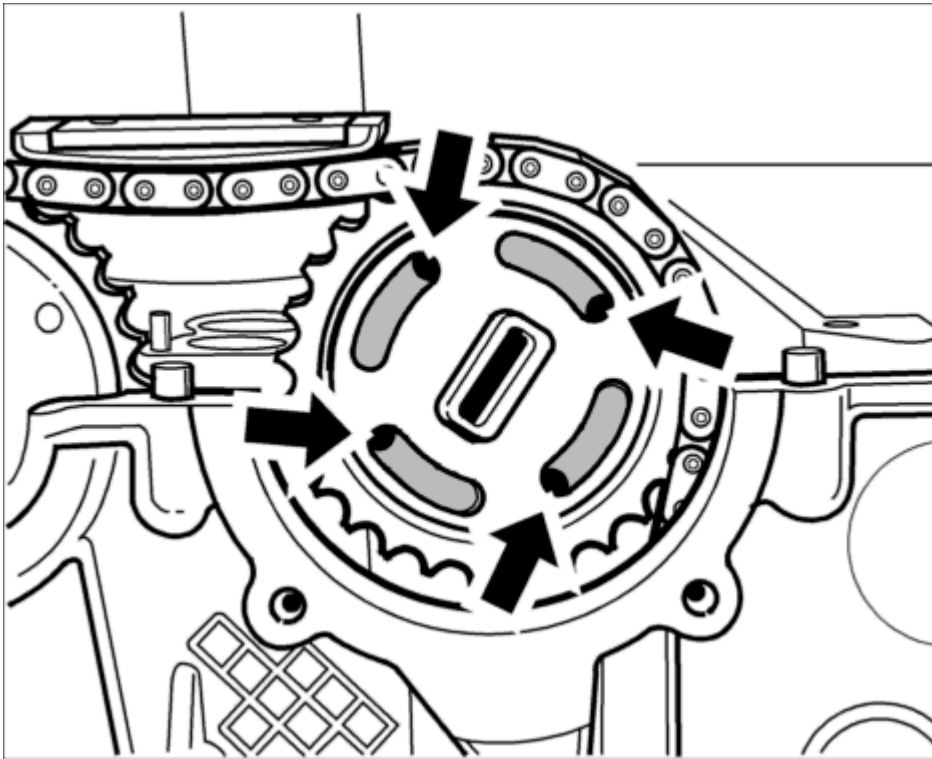


Fig. 28: Position of sprocket 4 - 6 at 60° before TDC
Courtesy of PORSCHE OF NORTH AMERICA, INC.

7. Insert exhaust camshaft sprocket in the timing chain and position on camshaft flange. The four threaded bores in the camshaft flange must be covered approximately half way by the slots of the sprocket **in the clockwise running direction of the engine -arrows-** . See **Fig. 28**.

8. Oil the bearing surfaces of the camshafts with new engine oil.

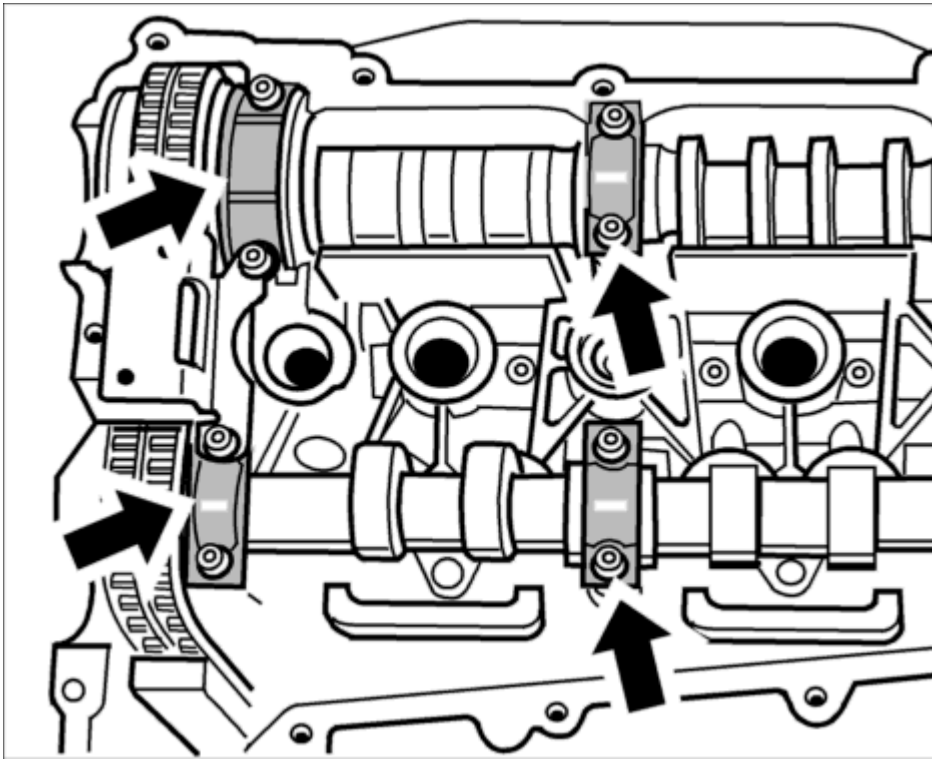


Fig. 29: Installation position of housing

Courtesy of PORSCHE OF NORTH AMERICA, INC.

NOTE:

- ***Do not interchange the thrust bearings of the inlet and exhaust camshafts during assembly; observe identification markings.***

9. Insert three thrust bearings and one housing **-arrows-** for the bearing sleeve of the camshafts together with the guide rail for the timing chain. See **Fig. 29**.

10. Insert eight housing screws (Torx): six M6 x 35 and two M6 x 40 for camshaft bearing and guide rail. Tighten screws evenly and just hand-tight.

Adjust timing, cylinder bank 4 - 6

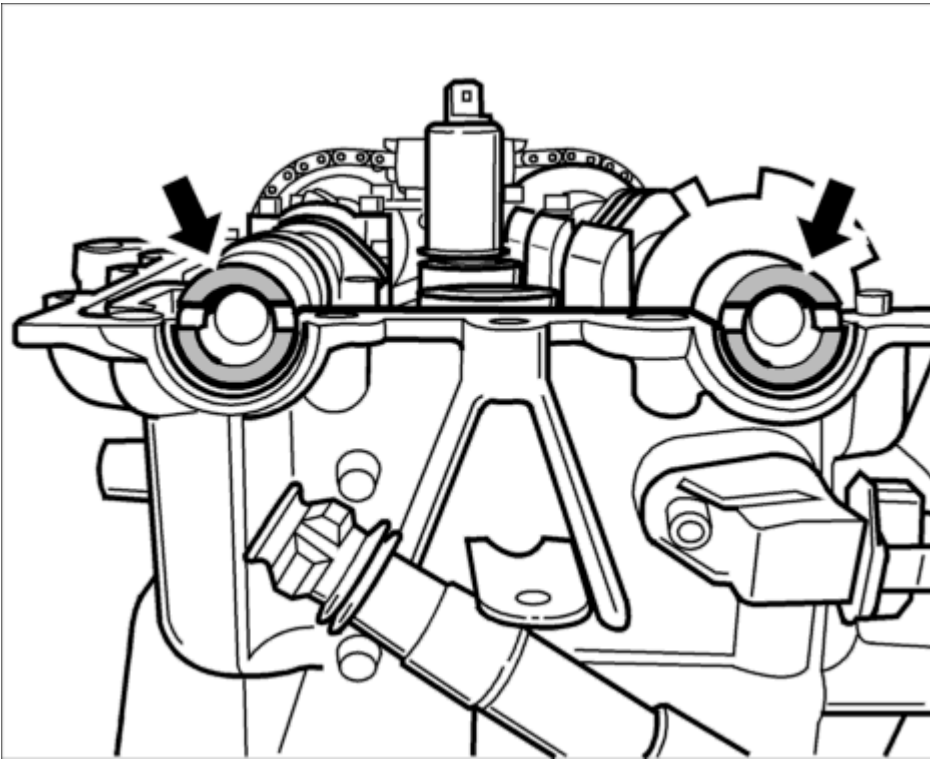


Fig. 30: Slot position of camshafts at overlap
Courtesy of PORSCHE OF NORTH AMERICA, INC.

11. Align both camshafts. The small circular cut-outs must point upwards **-arrows-** . See **Fig. 30**.

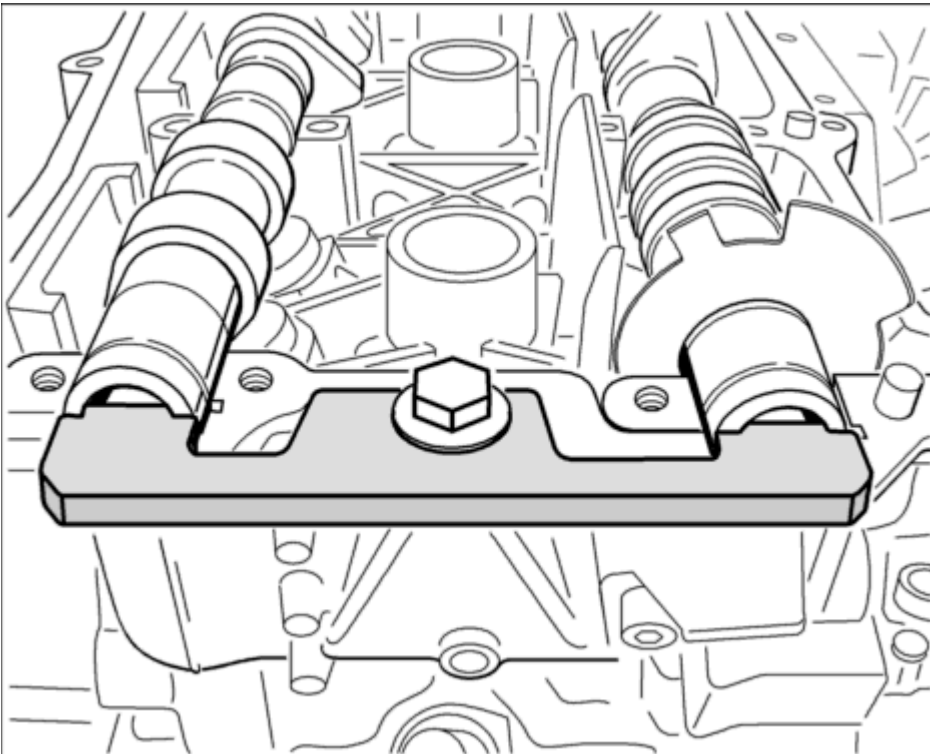
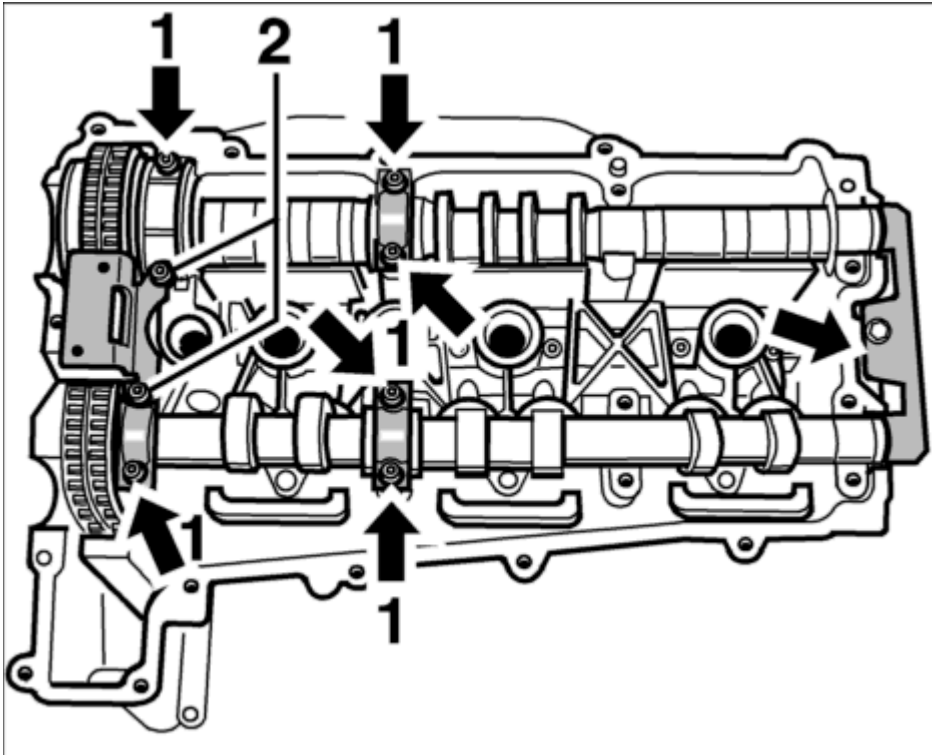


Fig. 31: Position of adjusting gauge 9689

Courtesy of PORSCHE OF NORTH AMERICA, INC.

12. Using special tool **adjusting gauge P 9686**, fix camshafts (if necessary with the gauge twisted) with an M8 screw (e. g. hexagon-head bolt M8 x 16). The flat tool face points upwards. Screw in fastening screw by hand.

**Fig. 32: Housing screws and adjusting gauge**

Courtesy of PORSCHE OF NORTH AMERICA, INC.

13. Screw the housing screws of the inlet and exhaust camshafts and the auxiliary screw of the adjustment gauge alternately by approx. another 90° until the specified tightening torque is reached. --> **Tightening torque: 7.5 ftlb.** ; --> **Tightening torque: 17 ftlb.**

14. Insert guide rail screw with a new O-ring and tighten (hexagon socket M6, a/f 5) Grease O-ring with Optimol MP3. --> **Tightening torque: 7.5 ftlb.**

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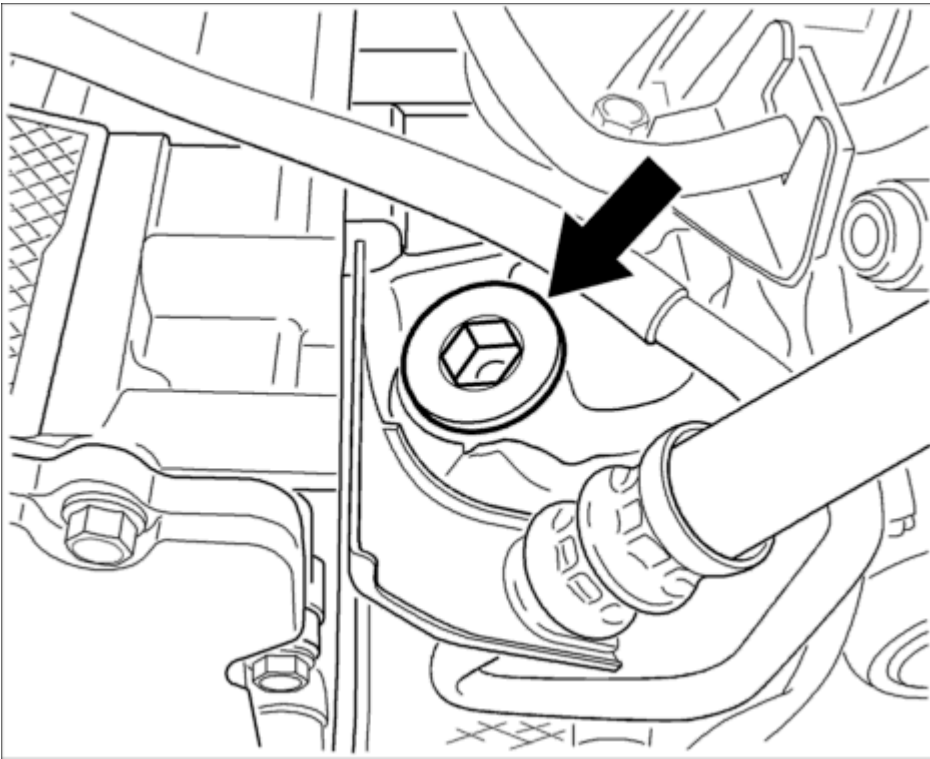


Fig. 33: Chain tensioner, cylinders 4 - 6

Courtesy of PORSCHE OF NORTH AMERICA, INC.

15. Fit the chain tensioner, side 4-6 (hexagon socket a/f 14). Fit chain tensioner with new aluminum sealing ring and tighten. --> **Tightening torque: 59 ftlb.**

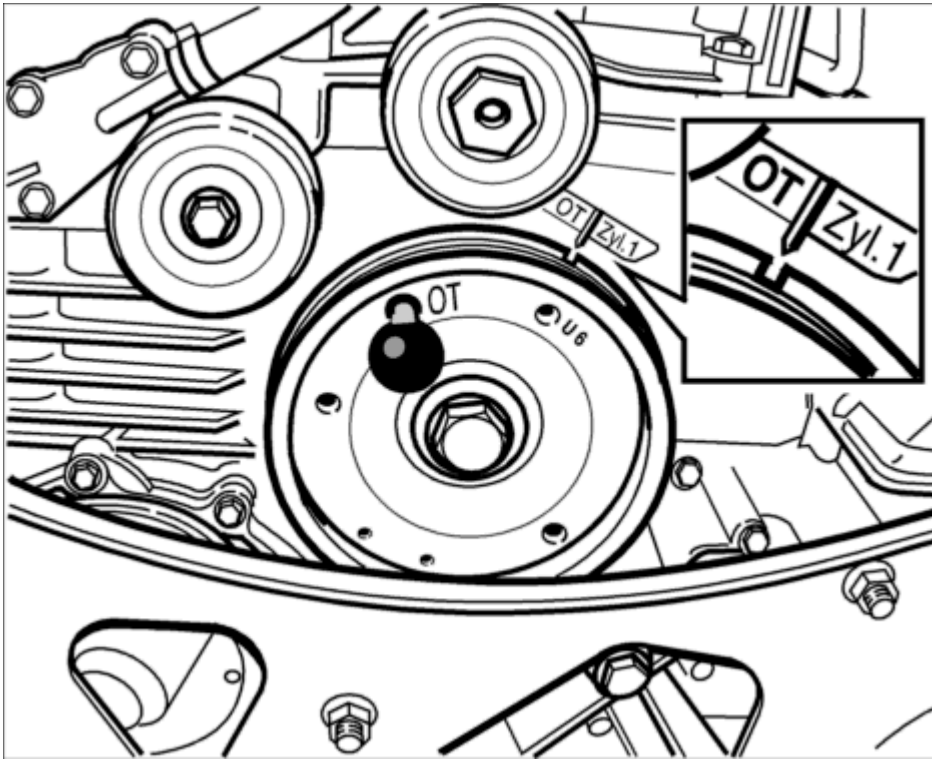


Fig. 34: Pulley fixed at TDC marking

Courtesy of PORSCHE OF NORTH AMERICA, INC.

NOTE:

- ***Position crankshaft above the pulley or vibration balancer before final adjustment of the timing to the TDC marking.***

16. Turn the crankshaft by means of the pulley or vibration balancer **clockwise (running direction of engine to TDC mark : TDC marking on pulley or vibration balancer coincides with fixing bore in crankcase . Fix with locating pin P 9595/1.**

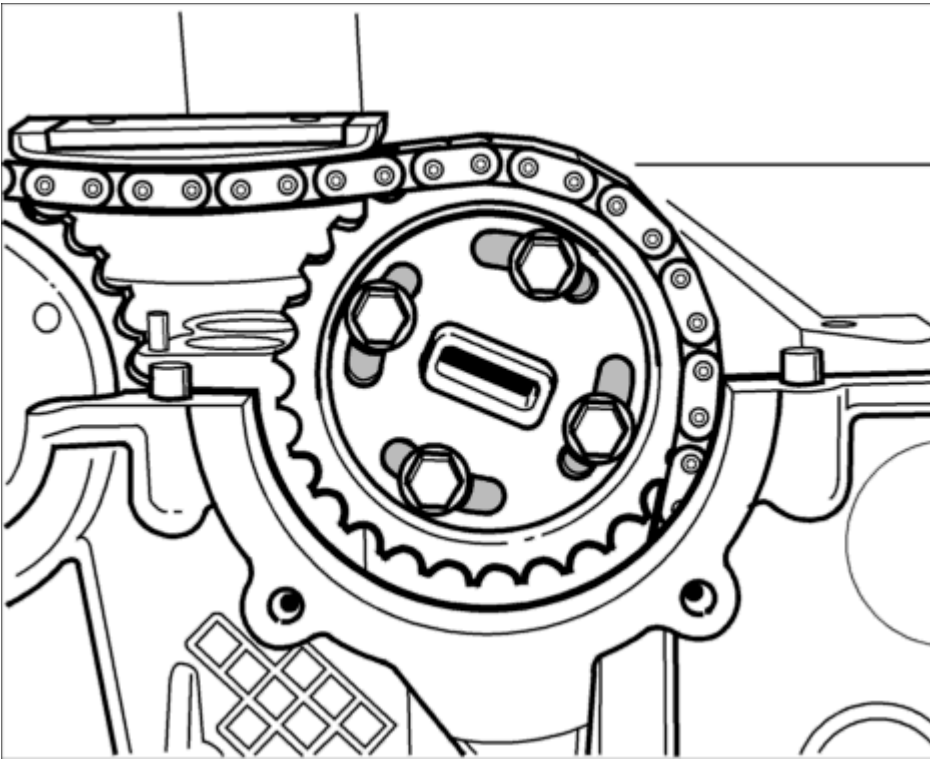


Fig. 35: Exhaust camshaft sprocket tightened
Courtesy of PORSCHE OF NORTH AMERICA, INC.

17. Insert four Torx screws M6 to sprocket of exhaust camshaft and tighten evenly in diagonally opposite sequence. --> **Tightening torque: 10.5 ftlb.**

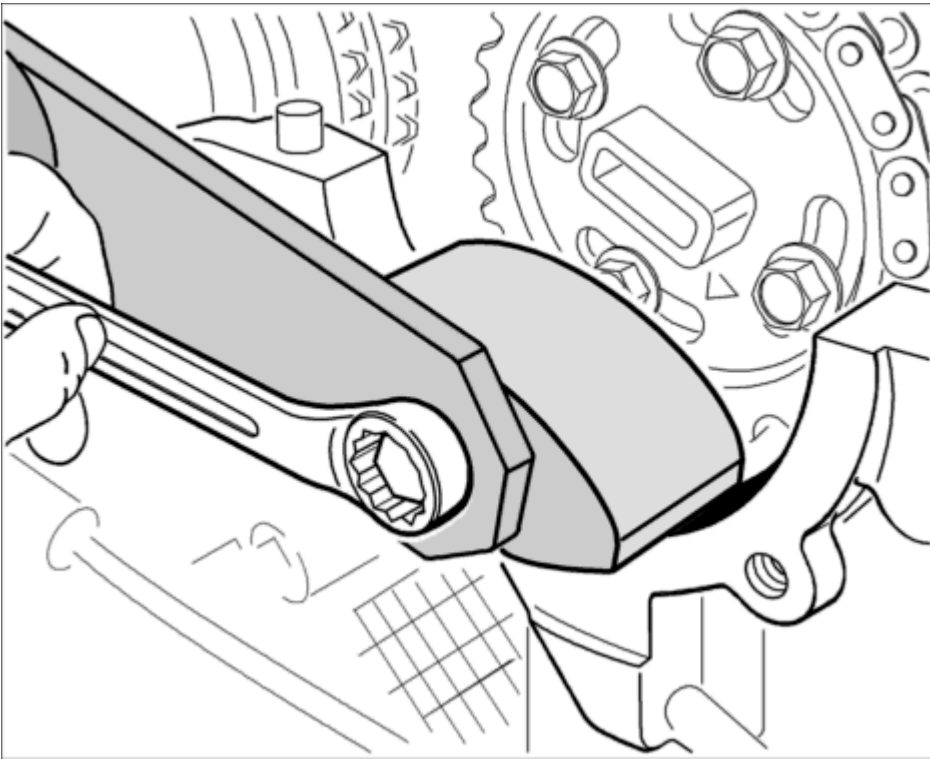


Fig. 36: Contact block at the fitting bore of the cylinder head

Courtesy of PORSCHE OF NORTH AMERICA, INC.

18. Tighten the central screw of the camshaft adjusting device. Fit special tool **retaining tool P 9685** on hexagon of intermediate piece of the central screw. Screw in the central screw gently by hand so that the loose contact block just touches the fitting bore of the oil suction pump. Fix the hexagon-head bolt to the contact block.

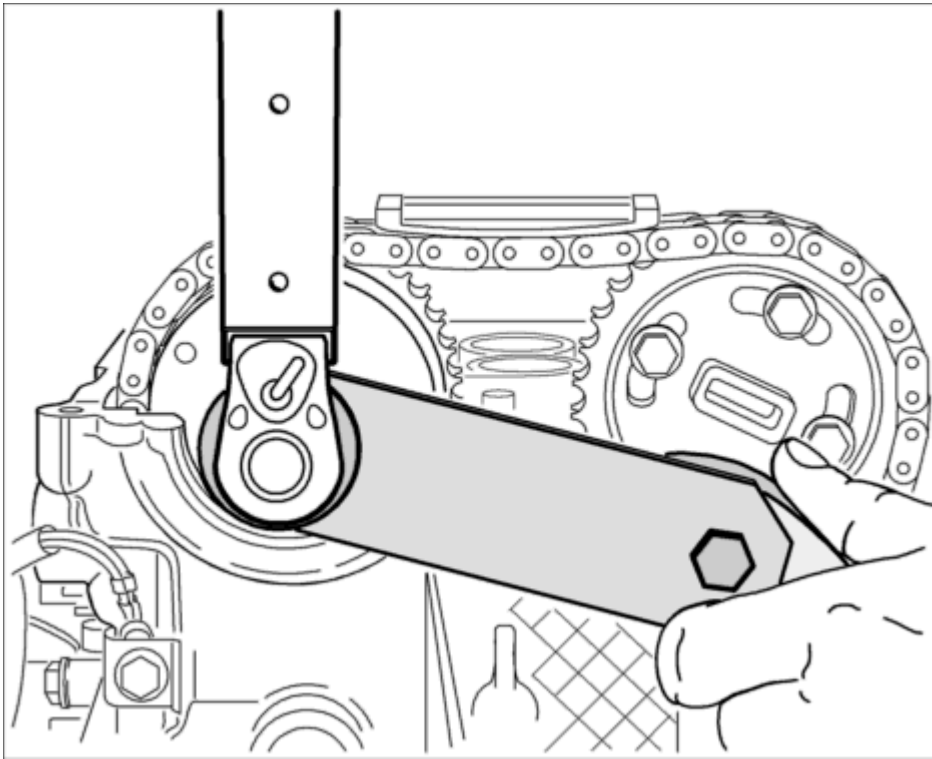


Fig. 37: Tighten central screw of camshaft adjusting device.

Courtesy of PORSCHE OF NORTH AMERICA, INC.

NOTE:

- ***Before final tightening (torque angle) of the central screw, the special tool adjusting gauge P 9686 must be removed.***

19. Tighten the central screw in two stages. Initial tightening to the specified torque. --> **Initial tightening: 37 ftlb.**

20. Remove special tool **adjustment gauge P 9686**. Undo the M8 screw and remove gauge.

21. Tighten central screw with torque angle wrench. --> **Final tightening torque angle: 110 °**

Assembly of cylinder bank 1-3

22. Turn the engine on the assembly support until cylinder bank 1 - 3 stands vertically upwards.

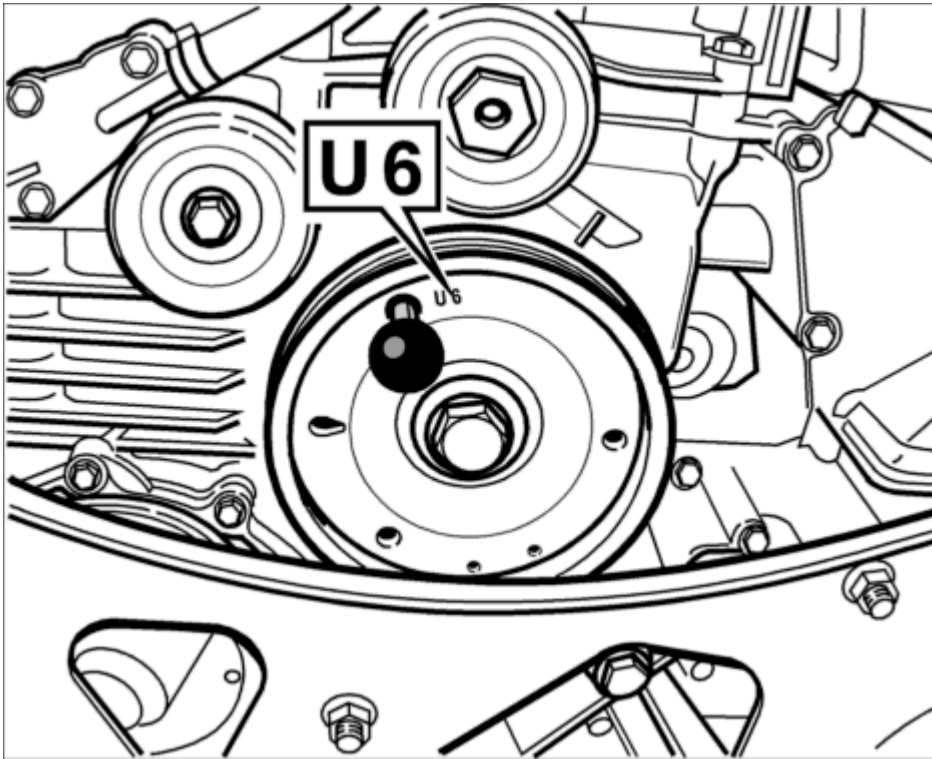


Fig. 38: Pulley fixed at 60° before TDC

Courtesy of PORSCHE OF NORTH AMERICA, INC.

23. Turn the crankshaft by means of the pulley or vibration balancer **clockwise (running direction of engine)** further still until the **marking U6 on pulley or vibration balancer coincides with fixing bore in crankcase (60° before TDC)**. Fix with **locating pin P 9595/1**.

24. Oil the bearing surfaces of the camshafts with new engine oil.

2007 Porsche Boxster

ENGINE Cylinder head, valve drive - Boxster And Cayman

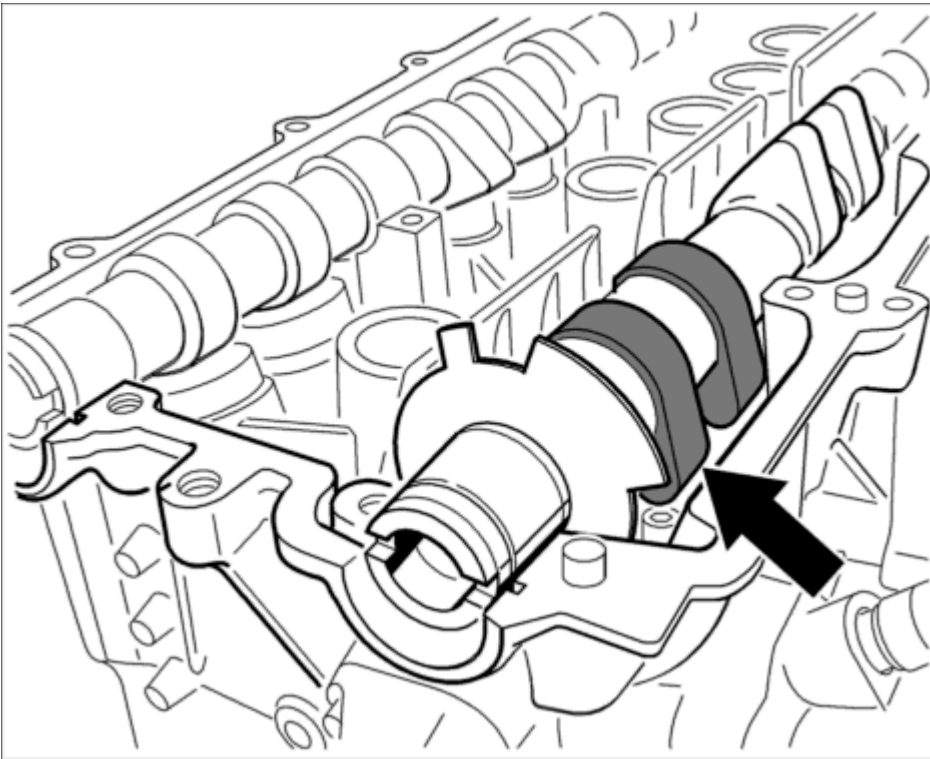


Fig. 39: Inlet camshaft 1-3 in overlap

Courtesy of PORSCHE OF NORTH AMERICA, INC.

25. Insert inlet camshaft 1-3. Pull the control chain out of the chain housing of the cylinder head with a welding wire and position on the toothed ring of the camshaft adjuster. Then insert the camshaft at overlapping TDC of cylinder 1 (the cams of cylinder 1 point diagonally downwards towards the outside of the cylinder head **-arrow-**).

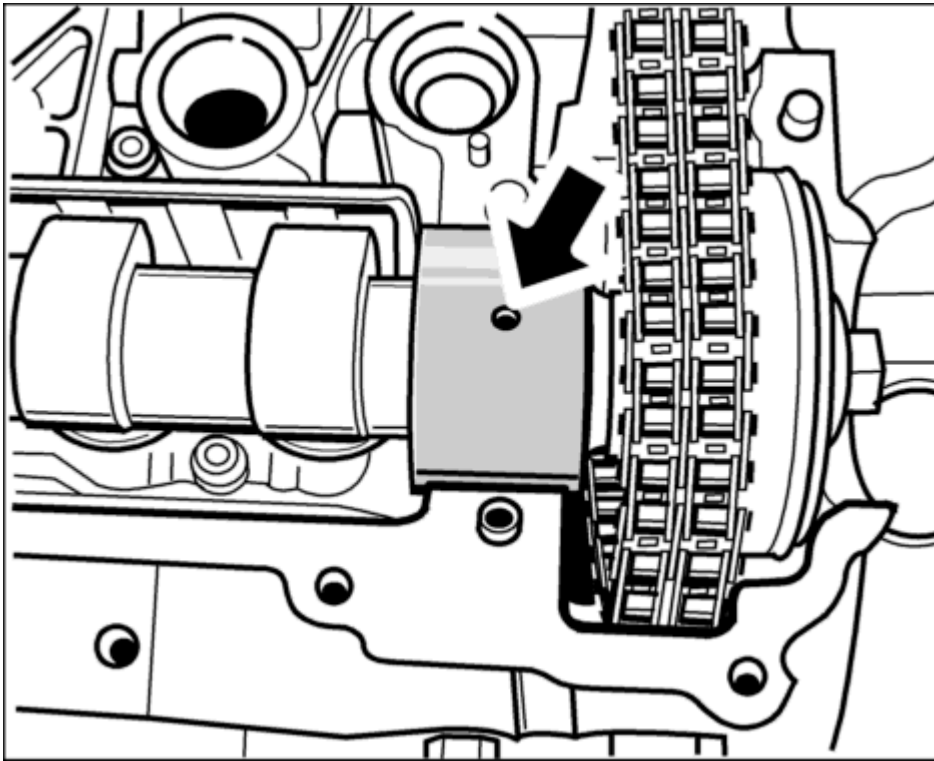


Fig. 40: Position of bearing sleeve for inlet camshaft
Courtesy of PORSCHE OF NORTH AMERICA, INC.

NOTE:

- ***Make sure that the bearing sleeve on the inlet camshaft is positioned correctly.***

26. The bearing sleeve of the inlet camshaft must be positioned so that the centrally bored blind hole points vertically upwards **-arrow-** (the rib of the cylinder head should also be at the center in relation to the bearing sleeve). In this position, the dowel pin in the bearing bore of the cylinder head will fit precisely into the opposite off-center blind hole bore. Any other bores are through-holes for guiding the oil.

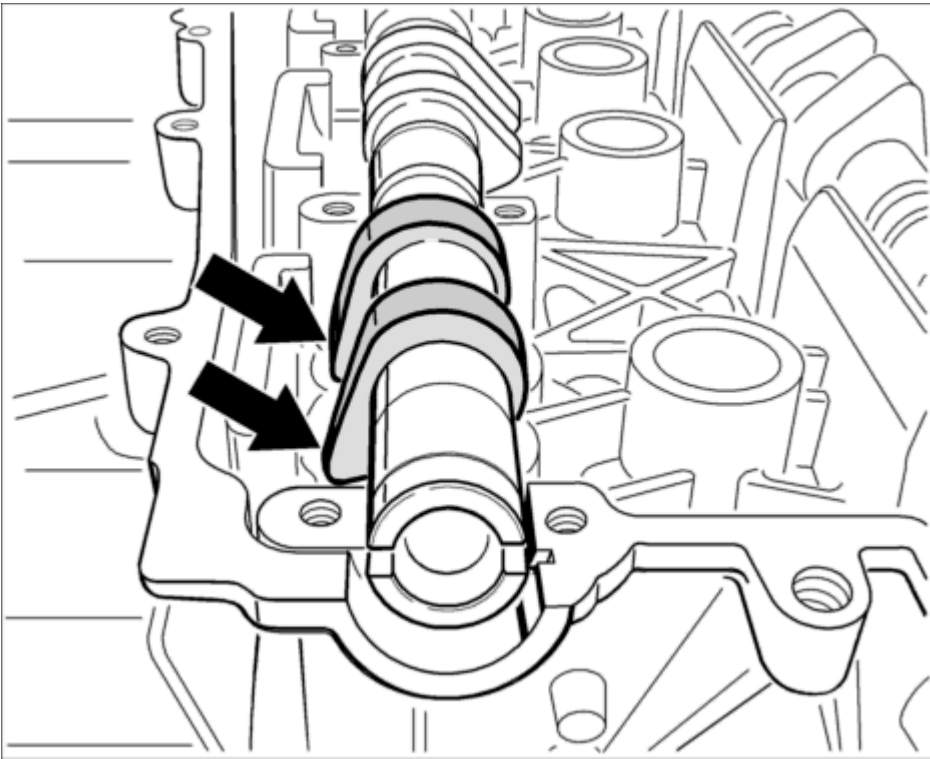


Fig. 41: Exhaust camshaft 1-3 in overlap

Courtesy of PORSCHE OF NORTH AMERICA, INC.

27. Insert exhaust camshaft 1 - 3. Lay the control chain on the flange for the chain sprocket, then insert the camshaft at overlapping TDC of cylinder 1 (the cams of cylinder 1 point diagonally downwards towards the outside of the cylinder head).

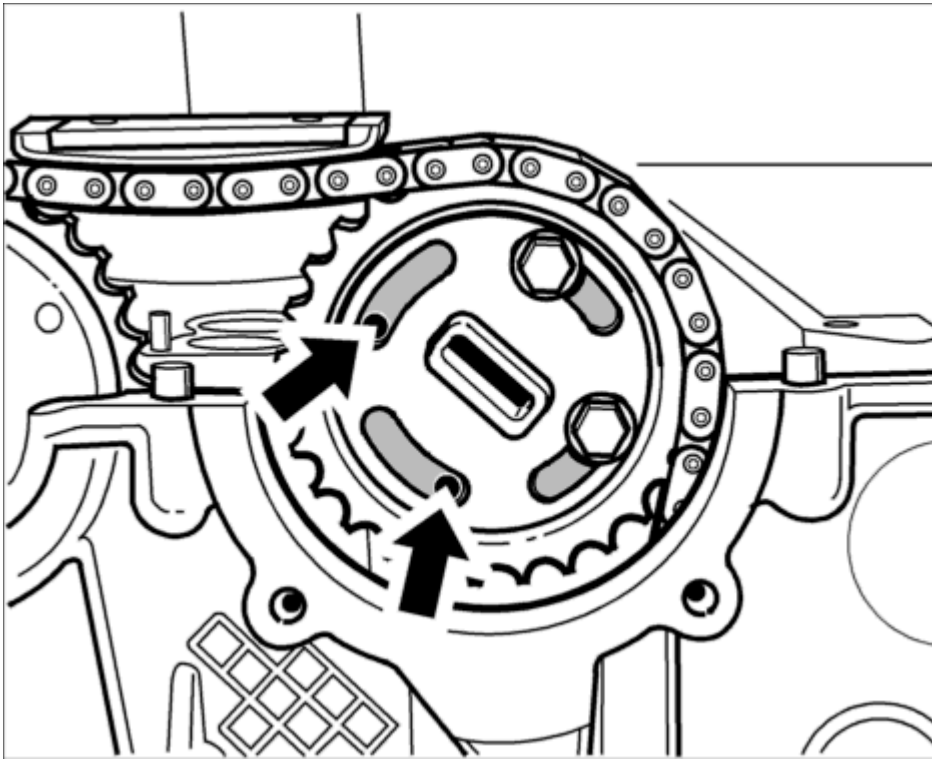


Fig. 42: Exhaust sprocket 1 - 3 at 60° before TDC

Courtesy of PORSCHE OF NORTH AMERICA, INC.

28. Insert exhaust camshaft sprocket in the timing chain and position on camshaft flange. The four threaded bores in the camshaft flange must be fully visible **on the left at the slotted curves of the sprocket -arrows-** so that the M6 x 12 Torx screws can still be positioned to fasten the sprocket. See **Fig. 42**.

2007 Porsche Boxster

ENGINE Cylinder head, valve drive - Boxster And Cayman

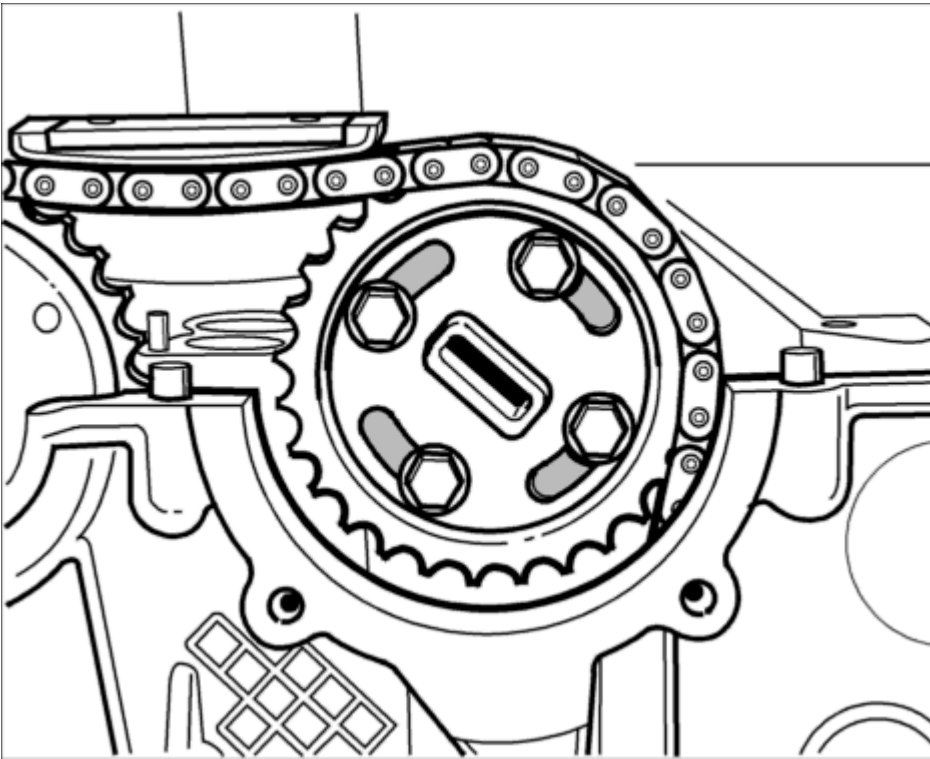


Fig. 43: Exhaust sprocket 1 - 3, all screws fitted
Courtesy of PORSCHE OF NORTH AMERICA, INC.

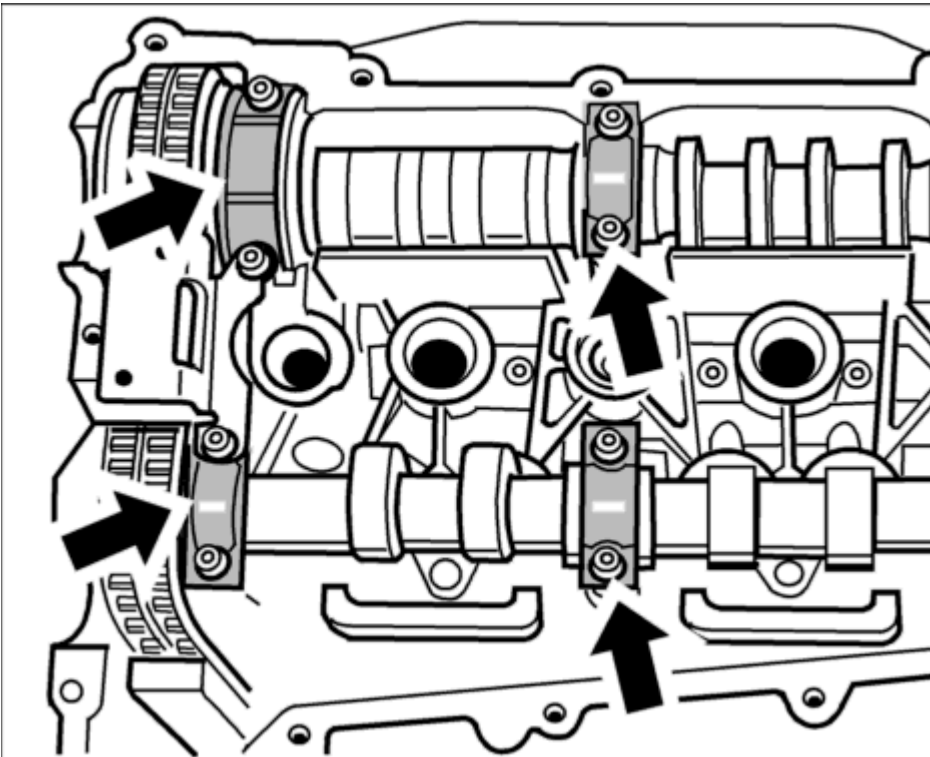


Fig. 44: Installation position of housing
Courtesy of PORSCHE OF NORTH AMERICA, INC.

NOTE:

- ***Do not interchange the thrust bearings of the inlet and exhaust camshafts during assembly; observe identification markings.***

29. Insert three thrust bearings and one housing **-arrows-** for the bearing sleeve of the camshafts together with the guide rail for the timing chain. See **Fig. 44**.

30. Insert eight housing screws (Torx): six M6 x 35 and two M6 x 40 for camshaft bearing and guide rail. Tighten screws evenly and just hand-tight.

Adjust timing, cylinder bank 1-3**NOTE:**

- ***Position crankshaft above the pulley or vibration balancer before final adjustment of the timing to the TDC marking.***

NOTE:

- ***Before final tightening (torque angle) of the central screw, the special tool adjusting gauge P 9686 must be removed.***

31. Final timing adjustment for cylinder bank 1-3 is analogous to that for cylinder bank 4-6 ;.

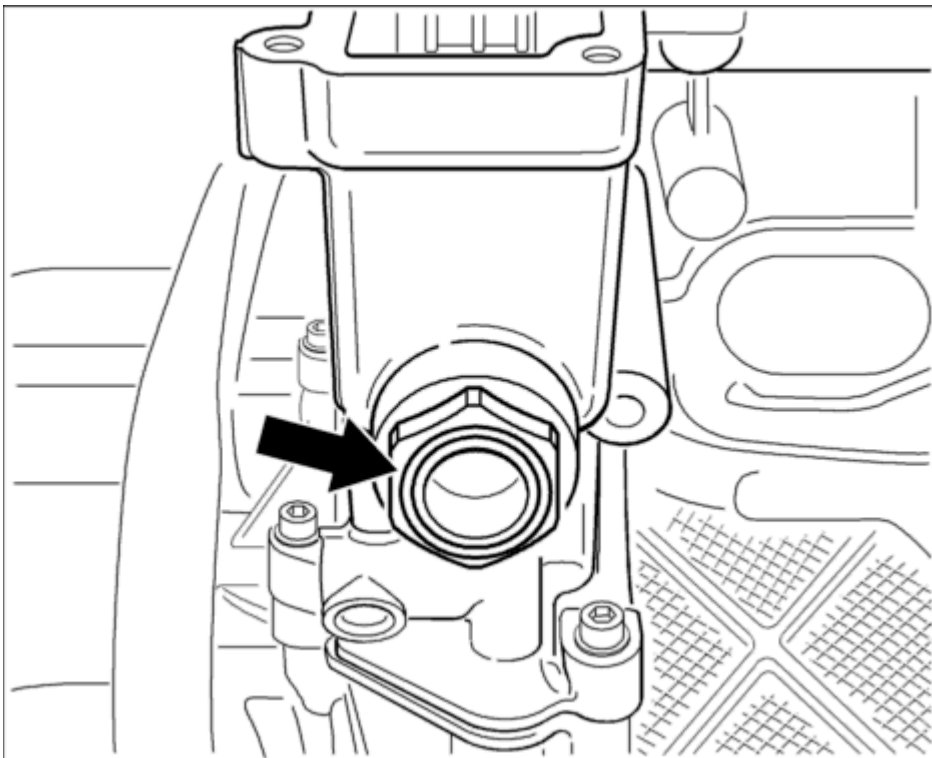


Fig. 45: Chain tensioner, cylinders 1 - 3

Courtesy of PORSCHE OF NORTH AMERICA, INC.

32. Fit chain tensioner for side 1-3 (hexagon a/f 32) before turning crankshaft to the TDC mark. Fit chain

tensioner with new sealing ring and tighten. --> **Tightening torque: 59 ftlb.**

After adjusting the timing, this should be re-checked.

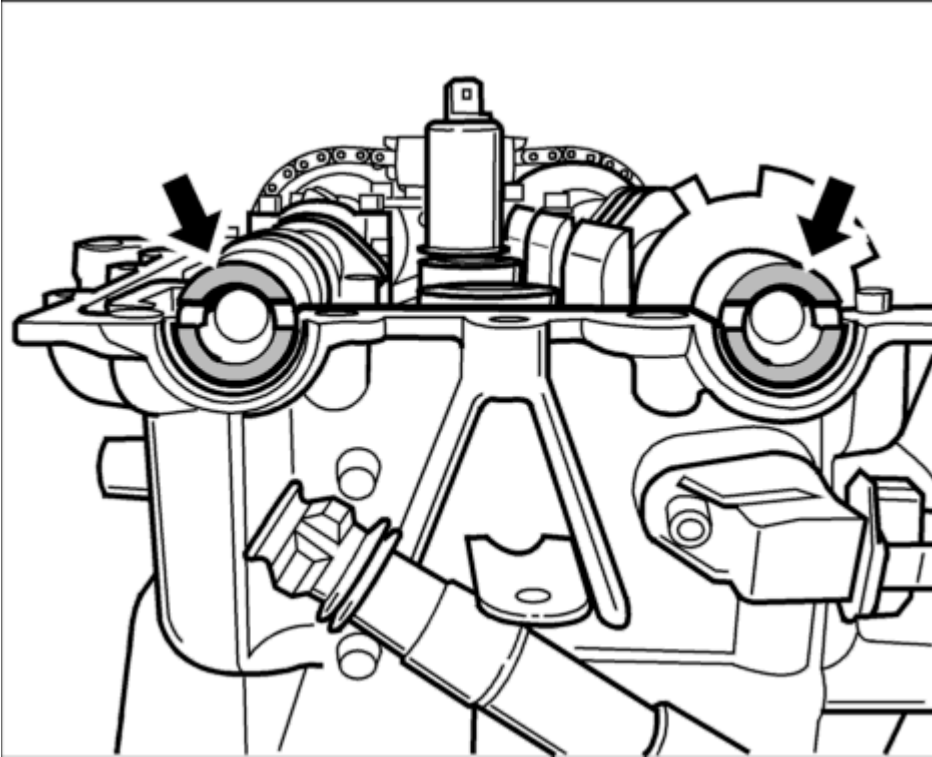


Fig. 46: Slot position of camshafts at overlap

Courtesy of PORSCHE OF NORTH AMERICA, INC.

33. Turn the engine 360° at the crankshaft and fix at the TDC mark. Check camshaft position of cylinder bank 4 - 6 using the **adjusting gauge P 9686**. Then turn a further 360° and check the camshaft position of cylinder bank 1 - 3.

SUBSEQUENT WORK FOR INSTALLING CAMSHAFTS

Subsequent work for installing camshafts

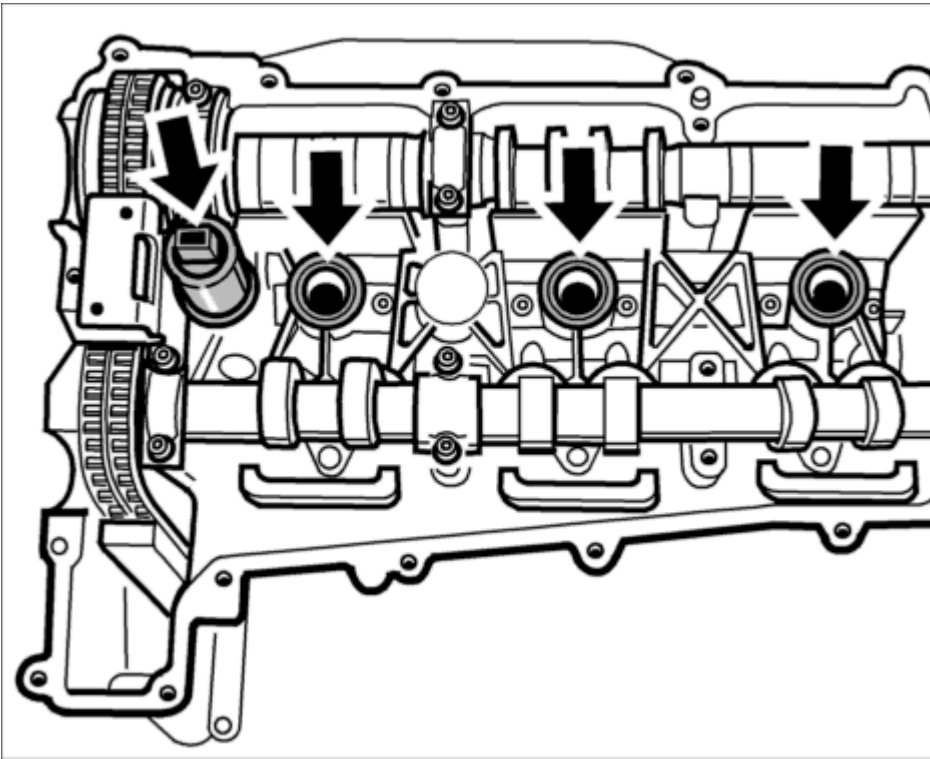


Fig. 47: Spark plug recess gaskets and solenoid hydraulic valve for camshaft timing
 Courtesy of PORSCHE OF NORTH AMERICA, INC.

1. Insert solenoid hydraulic valves and new gaskets for the spark-plug recesses. Fit new O-rings into the solenoid hydraulic valves and insert into the bores in the cylinder head (if necessary replace oil strainer). Grease O-rings with Optimol MP3 --> **153719 Removing and installing solenoid hydraulic valve for camshaft timing - chapter on "Installing"**.
2. Install cylinder head cover --> **158220 Removing and installing cylinder head cover - engine removed - chapter on "installing"**.
3. Fit oil suction pump (1 - 3) and tandem pump (4 - 6) with new, micro-self-locking Torx screws M6. Replace O-rings and grease with Optimol MP3. Fit vacuum line with new O-rings at tandem pump. --> **Tightening torque: 7.5 ftlb.**
4. Fit new plastic cap dry on cylinder head. Tap in with a plastic hammer.
5. Fit ground strap to cylinder head 1 - 3 with Torx screw M8 x 20 and tighten. --> **Tightening torque: 17 ftlb.**

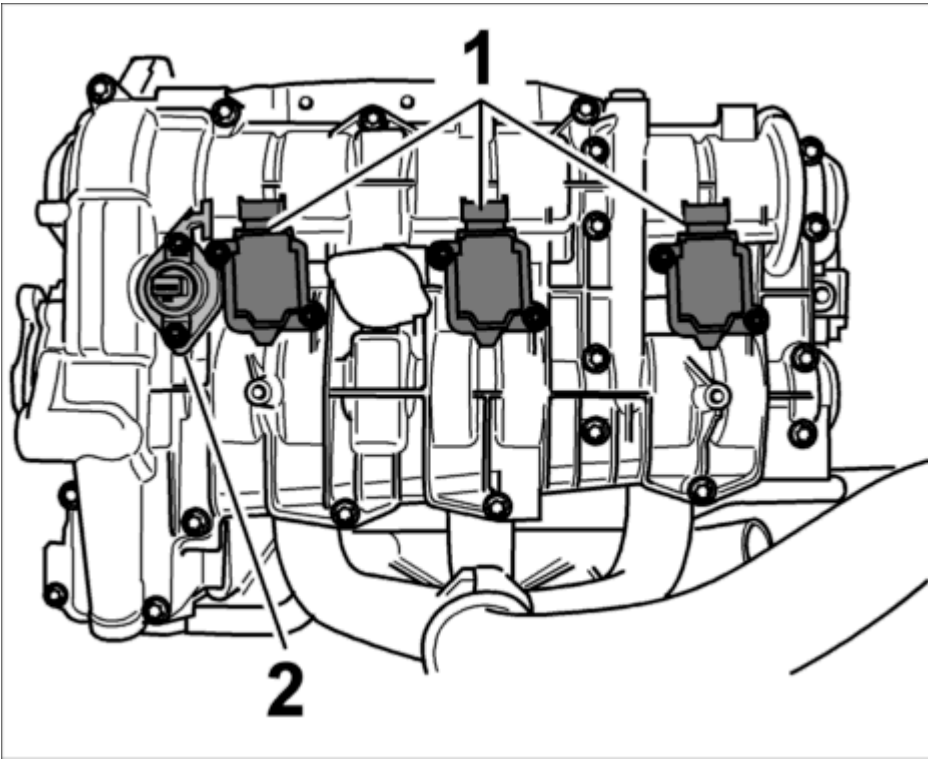


Fig. 48: Hydraulic valves for camshaft adjustment and ignition coils

Courtesy of PORSCHE OF NORTH AMERICA, INC.

6. Insert each ignition coil into its spark plug recess -1- , fit two M6 x 25 Torx socket screws and tighten. --> **Tightening torque: 7.5 ftlb. . See Fig. 48.**

7. Fit new retainer plates and holder for the solenoid hydraulic valves -2- --> **153719 Removing and installing solenoid hydraulic valve for camshaft timing - chapter on "Installing". --> Tightening torque: 7.5 ftlb. . See Fig. 48.**

8. Connect cable plugs to the oil temperature switch for cylinder bank 1 - 3.

15 05 20 REMOVING AND INSTALLING CAMSHAFT - AS OF MY 2005 (BOXSTER S, BOXSTER S RHD)

TOOLS

Designation	Type	Number	Explanation	
cover for dust protection when fitting the engine	special tool	NR.165		
locating pin	special tool	P 9595/1		
retaining tool	special tool	P 9685		
adjusting gauge	special tool	P 9686		

CAMSHAFT DESIGNATION M96.25

2007 Porsche Boxster

ENGINE Cylinder head, valve drive - Boxster And Cayman

Camshaft designation M96.25

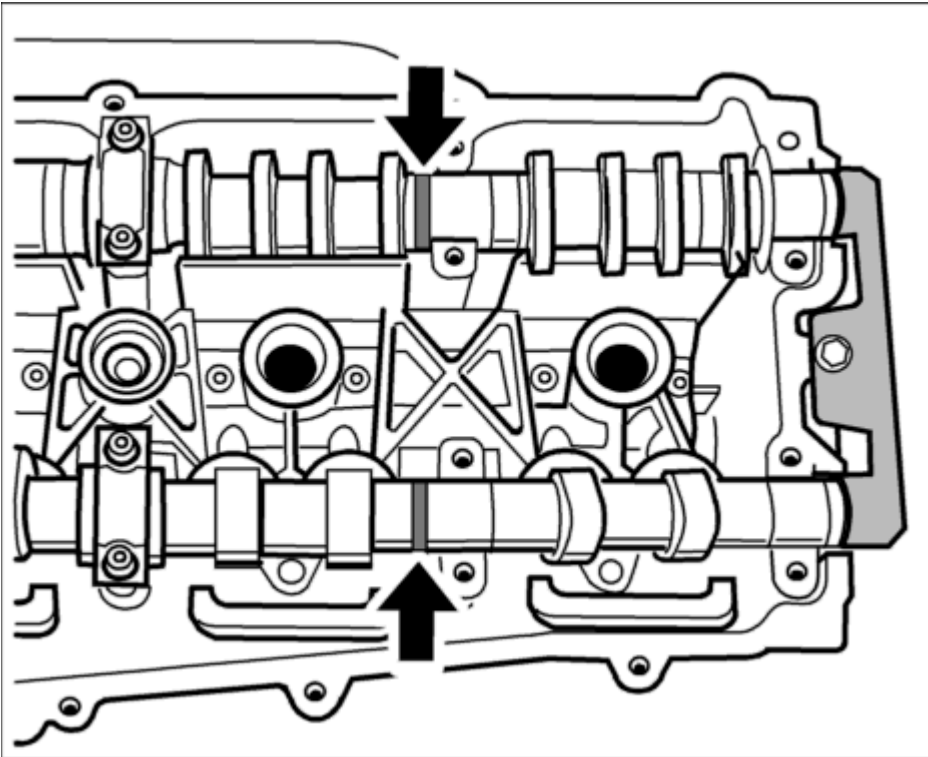


Fig. 49: Position of camshaft designation
Courtesy of PORSCHE OF NORTH AMERICA, INC.

Position of lettering: -arrows-

Camshafts for cylinders 1 - 3

- Inlet camshaft: 996.105.057.00 2,7 IN 1-3
- Exhaust camshaft: 996.105.065.00 2,7 EX 1-3

Camshafts for cylinders 4 - 6:

- Inlet camshaft: 996.105.058.00 2,7 IN 4-6
- Exhaust camshaft: 996.105.066.25 2,7 EX 4-6 (with aluminum plugs)

2007 Porsche Boxster

ENGINE Cylinder head, valve drive - Boxster And Cayman

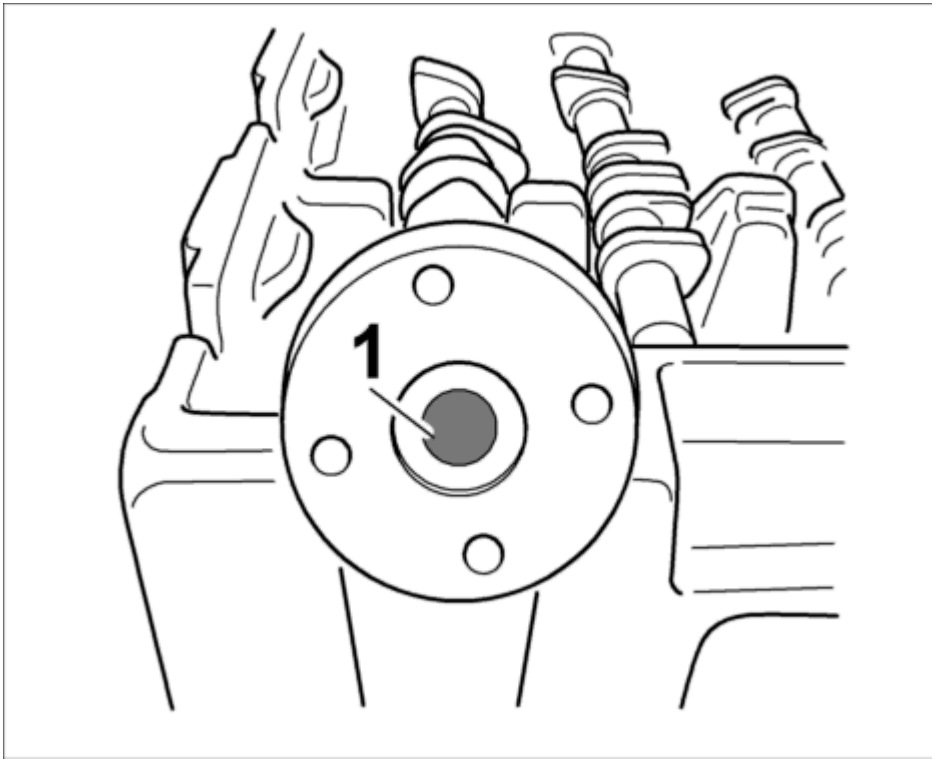


Fig. 50: aluminum plugs in exhaust camshaft 4 - 6
Courtesy of PORSCHE OF NORTH AMERICA, INC.

Additional identifying feature for exhaust camshaft 4 - 6: aluminum plugs with lubrication bore -1- for tandem pump. See **Fig. 50**.

CAMSHAFT DESIGNATION M96.26

Camshaft designation M96.26

2007 Porsche Boxster

ENGINE Cylinder head, valve drive - Boxster And Cayman

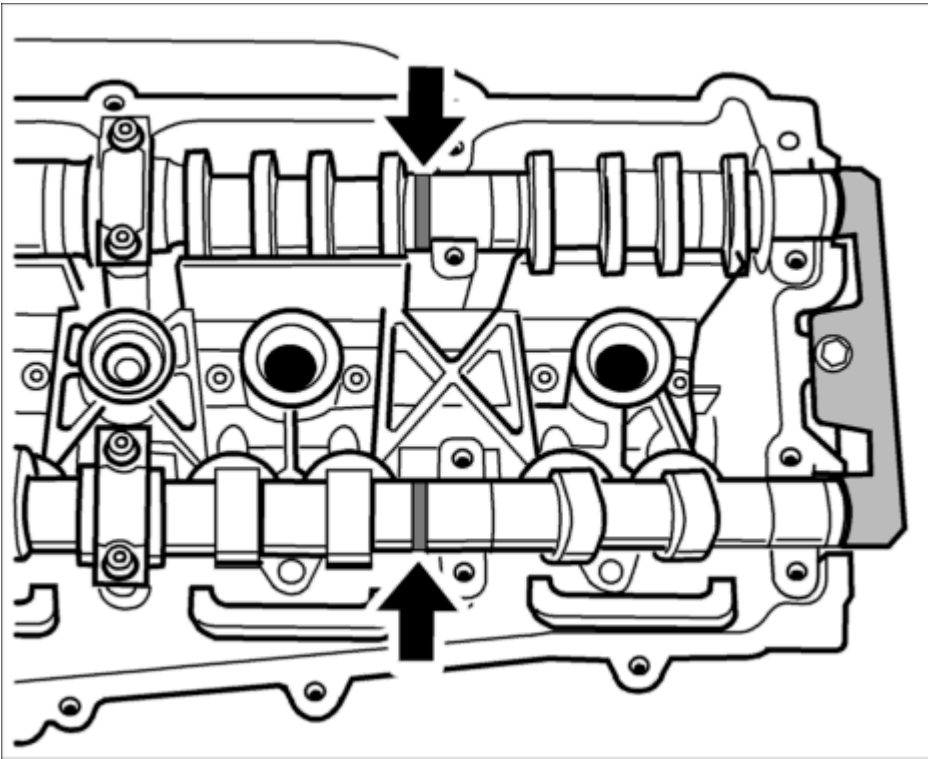


Fig. 51: Position of camshaft designation
Courtesy of PORSCHE OF NORTH AMERICA, INC.

Position of lettering: -arrows- . See Fig. 51.

Camshafts for cylinders 1 - 3

- Inlet camshaft: 996.105.049.00 3,2 IN 1-3
- Exhaust camshaft: 996.105.063.00 3,2 EX 1-3

Camshafts for cylinders 4 -6:

- Inlet camshaft: 996.105.050.00 3,2 IN 4-6
- Exhaust camshaft: 987.105.064.26 3,2 EX 4-6 (with aluminum plugs)

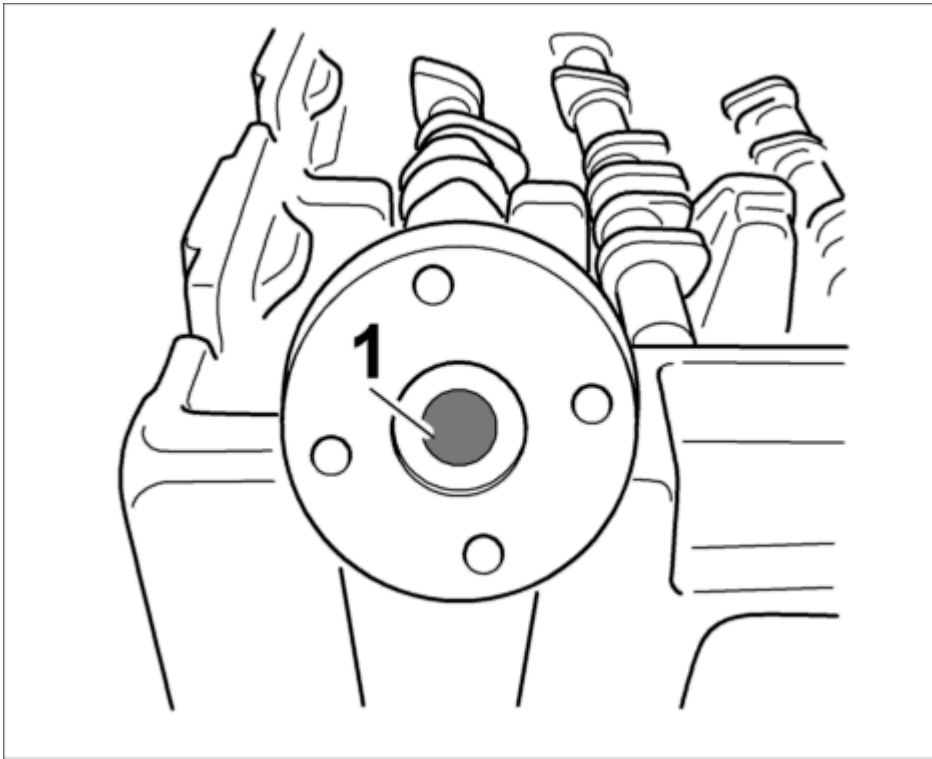


Fig. 52: aluminum plugs in exhaust camshaft 4 - 6
Courtesy of PORSCHE OF NORTH AMERICA, INC.

Additional identifying feature for exhaust camshaft 4 - 6: aluminum plugs with lubrication bore **-1-** for tandem pump. See **Fig. 52**.

ALLOCATION OF INLET CAMSHAFT ADJUSTMENT DEVICE

Allocation of inlet camshaft adjustment device

Camshaft adjustment device on inlet camshaft, cylinder bank 1 - 3

2007 Porsche Boxster

ENGINE Cylinder head, valve drive - Boxster And Cayman

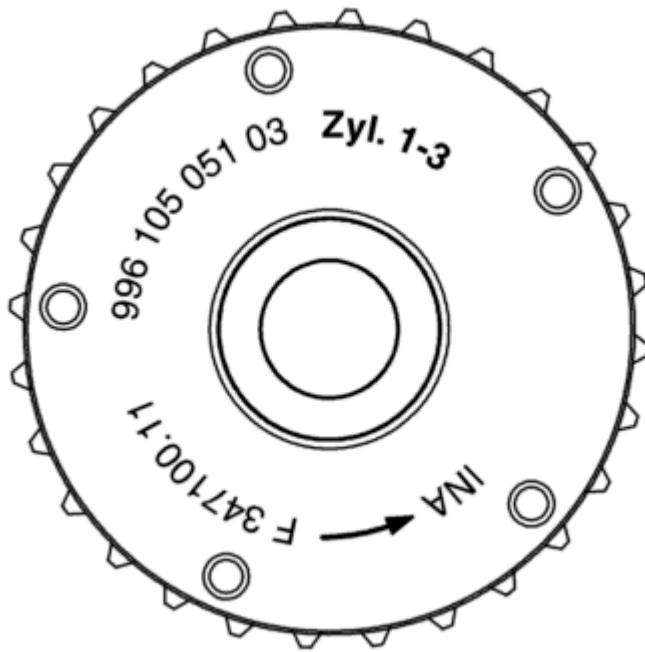


Fig. 53: Designation of adjuster 1 - 3

Courtesy of PORSCHE OF NORTH AMERICA, INC.

NOTE:

- ***Side 1 - 3: the arrow should be attached anti-clockwise***

- Designation, side 1 - 3:

- Part number, cylinder bank, manufacturer information, direction of rotation of engine (arrow), production date.

Camshaft adjustment device on inlet camshaft, cylinder bank 4 - 6

2007 Porsche Boxster

ENGINE Cylinder head, valve drive - Boxster And Cayman

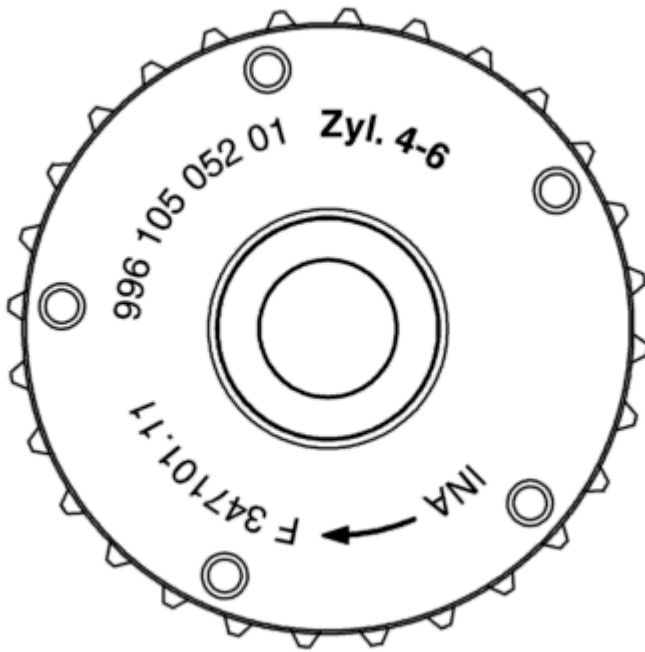


Fig. 54: Designation of adjuster 4 -6

Courtesy of PORSCHE OF NORTH AMERICA, INC.

NOTE:

- ***Side 4 - 6: the arrow should be attached clockwise***

- Designation, side 4 - 6:

- Part number, cylinder bank, manufacturer information, direction of rotation of engine (arrow), production date.

ALLOCATION OF CHAIN TENSIONERS

Allocation of chain tensioners

2007 Porsche Boxster

ENGINE Cylinder head, valve drive - Boxster And Cayman

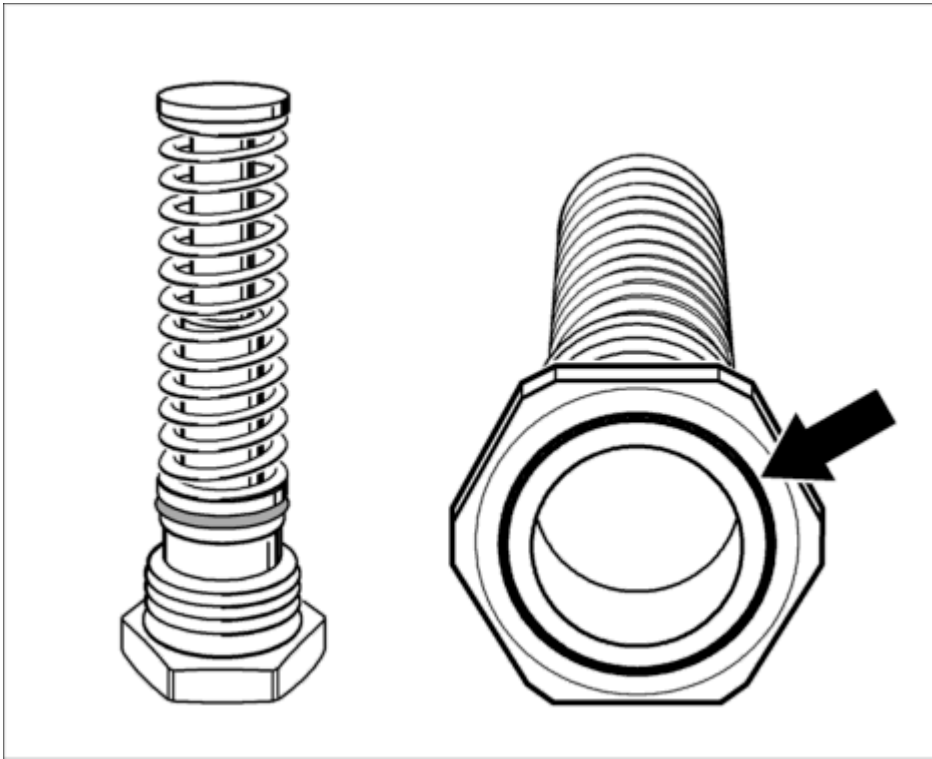


Fig. 55: Primary chain tensioner

Courtesy of PORSCHE OF NORTH AMERICA, INC.

- Primary chain tensioner on crankcase (oil filter area), identification: **one ring -Arrow-** . See **Fig. 55**.

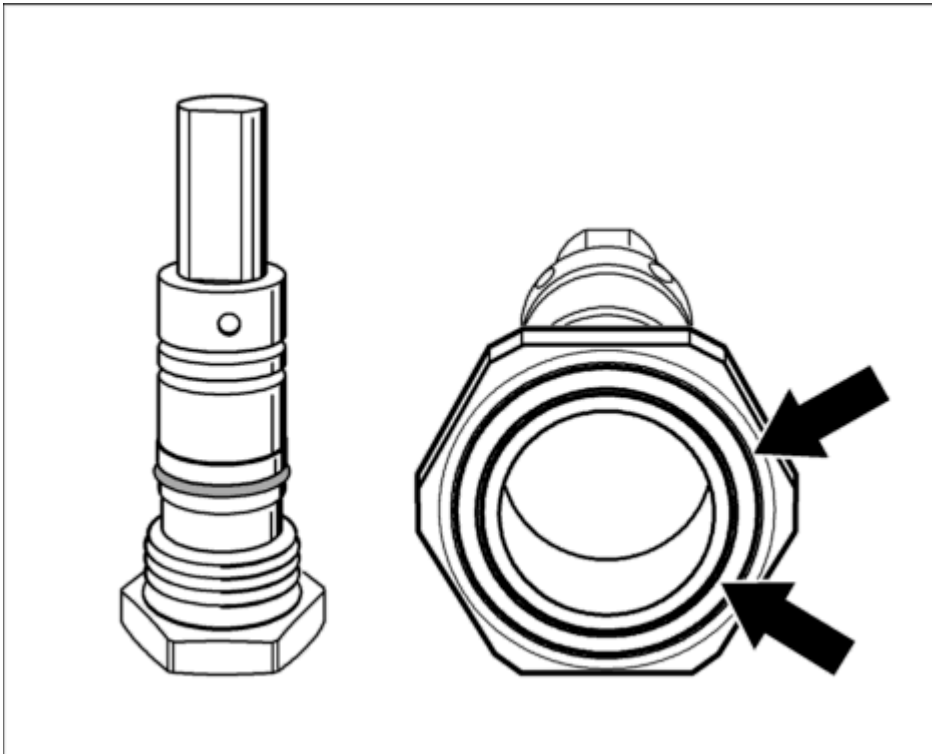
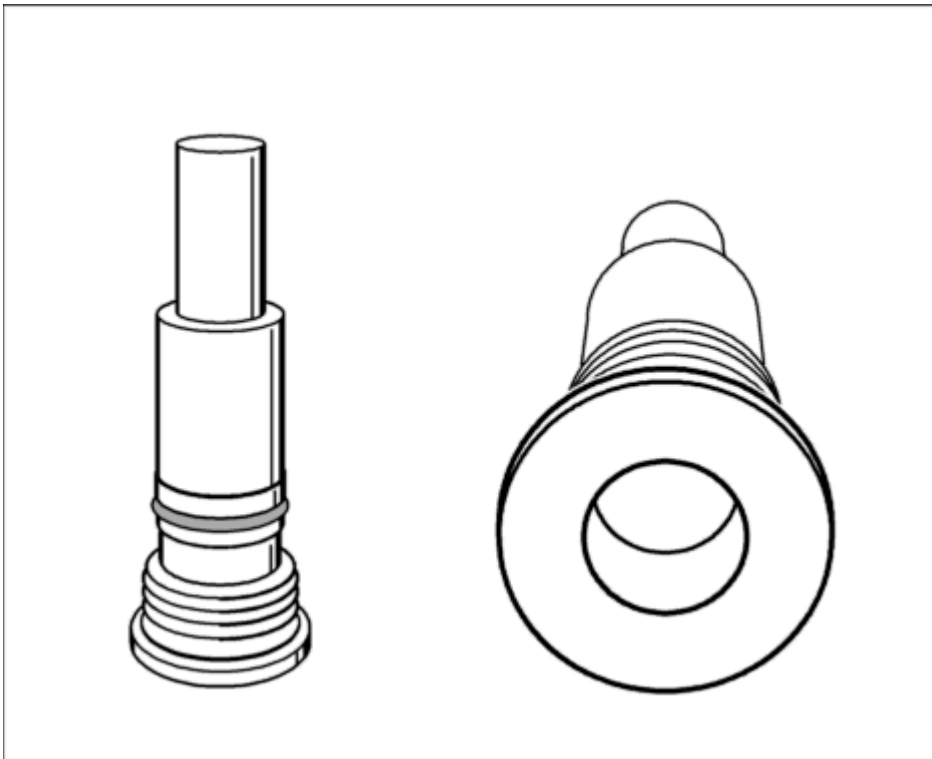


Fig. 56: Chain tensioner, cylinders 1 - 3

Courtesy of PORSCHE OF NORTH AMERICA, INC.

- Chain tensioner on cylinder head, cylinder bank 1 - 3, identification: **two rings -Arrows-** . See **Fig. 56**.

**Fig. 57: Chain tensioner 4 - 6**

Courtesy of PORSCHE OF NORTH AMERICA, INC.

- Chain tensioner on cylinder head, cylinder bank 4 - 6, no identification.

PRELIMINARY WORK FOR REMOVING CAMSHAFTS**Preliminary work for removing camshafts**

1. Remove engine. Refer to **10 01 19 Removing and installing engine - as of MY 2005 (Boxster, Boxster RHD, Boxster S, Boxster S RHD)** .

2. For disassembling cylinder bank 1 - 3, undo the ground cable on the cylinder head by unscrewing a Torx screw M8 and removing the cable. Unplug the cable plug for the oil pressure switch.

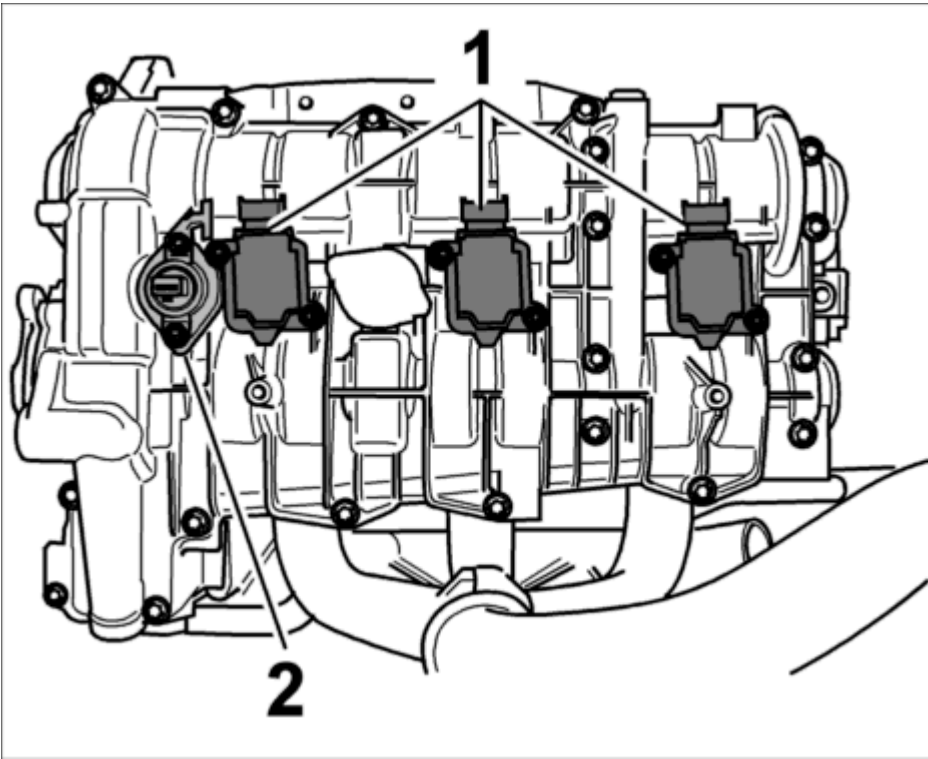


Fig. 58: Hydraulic valve for camshaft adjustment and ignition coils
Courtesy of PORSCHE OF NORTH AMERICA, INC.

3. Remove ignition coils -1- . In each case, unscrew two M6 x 25 Torx socket screws and pull the ignition coil out of the spark-plug recess.

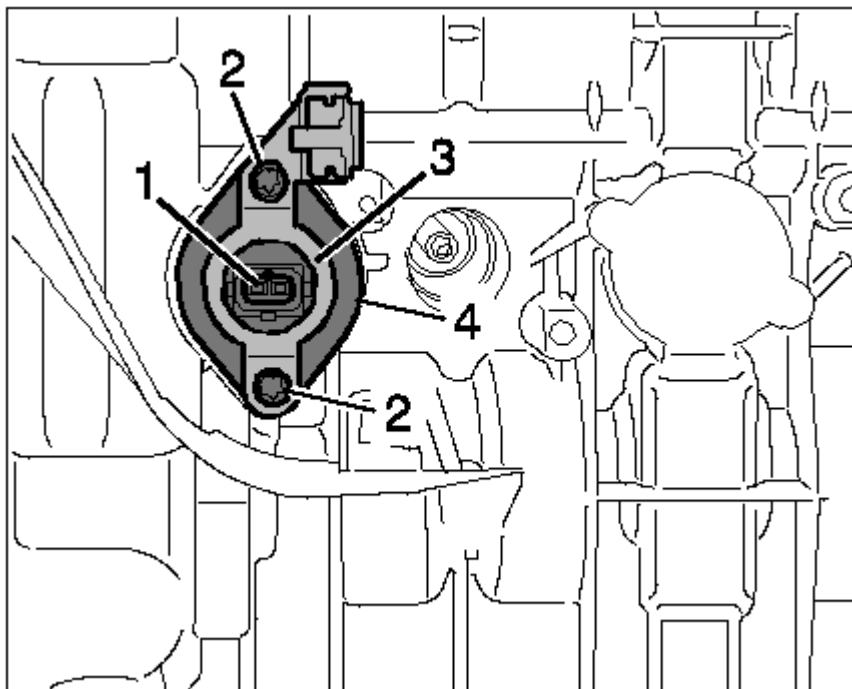
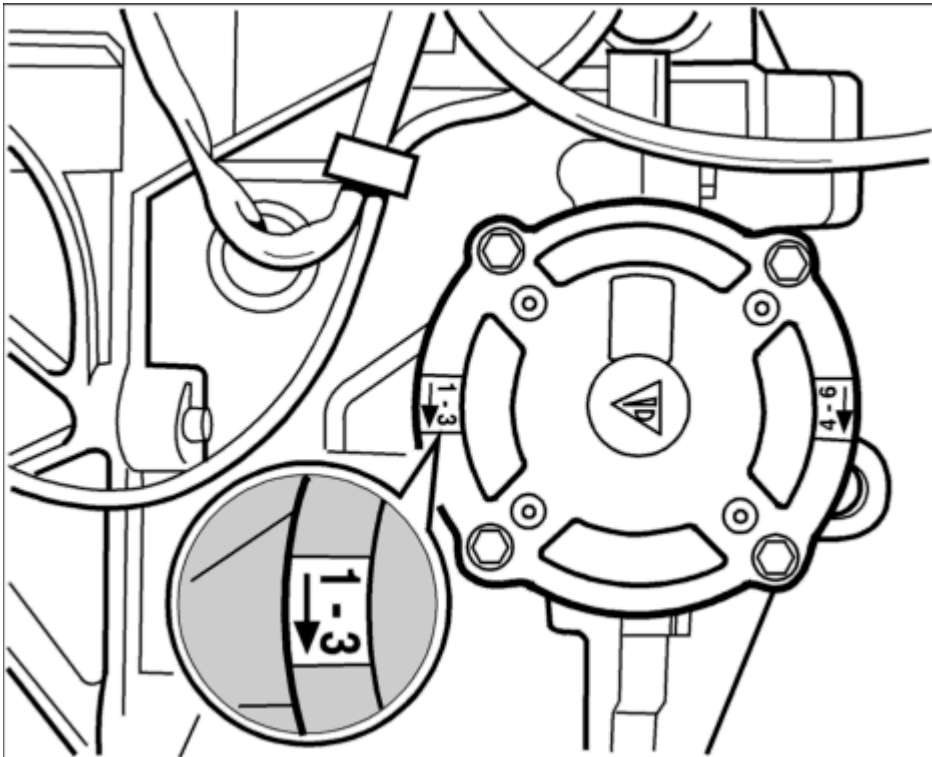


Fig. 59: Solenoid hydraulic valve for camshaft timing

Courtesy of PORSCHE OF NORTH AMERICA, INC.

4. Remove solenoid hydraulic valve -1- (for camshaft timing) --> **153719 Removing and installing solenoid hydraulic valve for camshaft timing - chapter on "Removing"**. See **Fig. 59**.
5. Remove spark plugs. Refer to **28 70 20 Removing and fitting spark plugs - as of MY 2005 (All Models)** .

**Fig. 60: Oil suction pump for cylinders 1 - 3**

Courtesy of PORSCHE OF NORTH AMERICA, INC.

6. Remove oil suction pump for cylinders 1 - 3. Unscrew four Torx screws M6 x 20 (micro-self-locking), remove oil suction pump, and replace O-ring and screws.

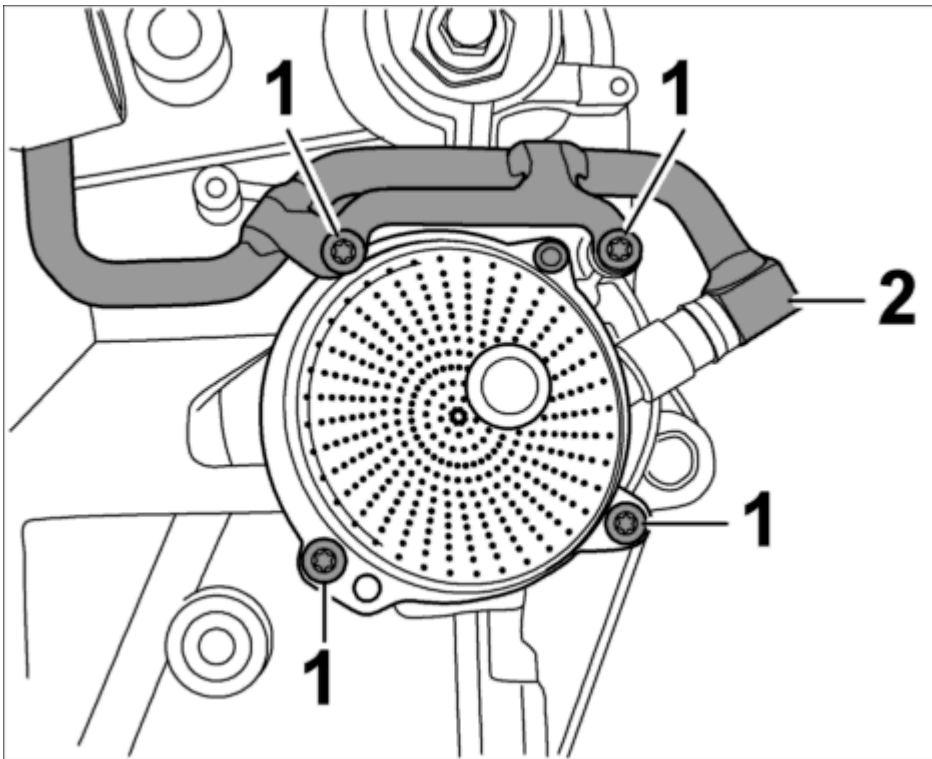


Fig. 61: Tandem pump side 4 - 6

Courtesy of PORSCHE OF NORTH AMERICA, INC.

7. Remove tandem pump for cylinders 4 - 6. Unscrew four Torx screws M6 (micro-self-locking) -1- . Pull off the vacuum line on pump -2- . Remove pump and replace O-rings and micro-self-locking screws. See **Fig. 61**.

REMOVING CAMSHAFT - ENGINE REMOVED

Removing camshaft - engine removed

CAUTION: Risk of damage due to particles of dirt.

- Oil bores/oil ducts can become blocked up.

--> When working on the engine, absolute cleanliness is essential.

--> Lay removed engine parts on a clean base and cover them without fail.

--> Use the **cover for dust protection when fitting the engine NR.165** on the engine assembly support.

1. Remove the plastic caps on the cylinder head. Press a small screwdriver into the center of the piercing point of each cap and lever out the cap.

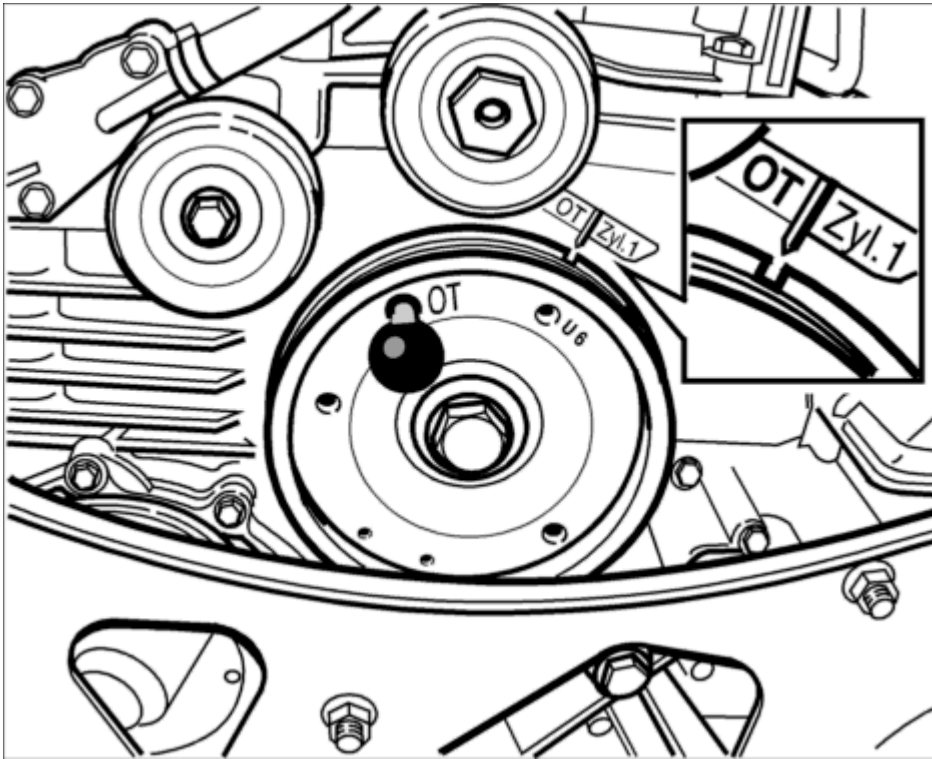


Fig. 62: TDC marking on pulley

Courtesy of PORSCHE OF NORTH AMERICA, INC.

2. **Disassembling cylinder bank 1 - 3** Turn crankshaft at the pulley/vibration balancer **clockwise** to the overlapping TDC of cylinder 1. **Disassembling cylinder bank 4 -6** Turn crankshaft to the TDC for cylinder 4. Using a **locating pin P 9595/1** fix the pulley or vibration balancer.

2007 Porsche Boxster

ENGINE Cylinder head, valve drive - Boxster And Cayman

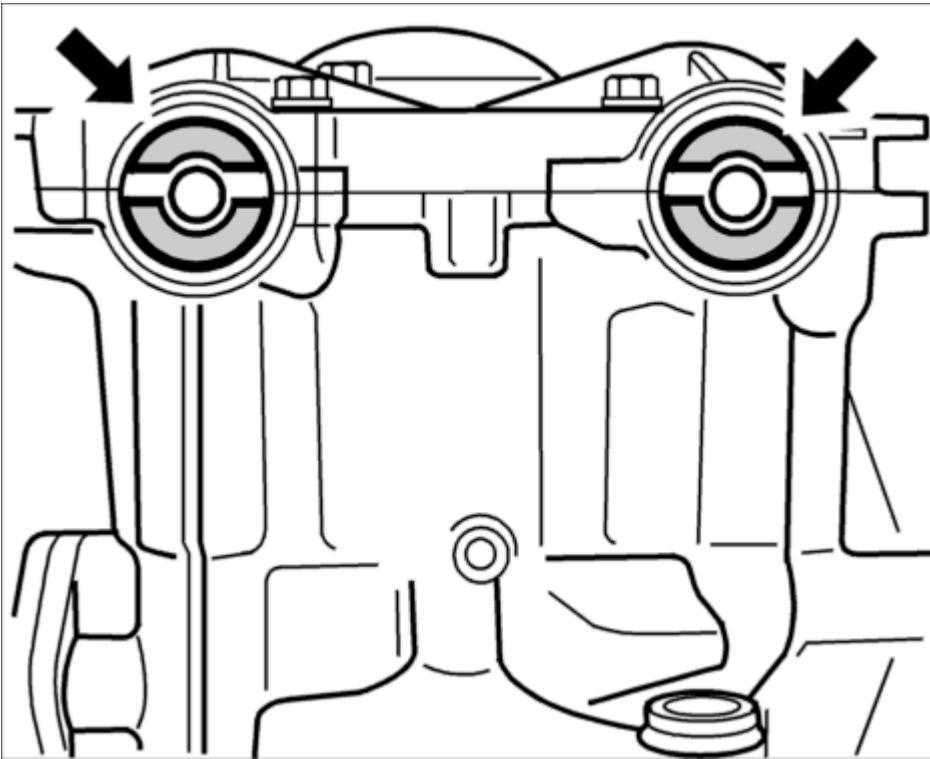


Fig. 63: Position of the camshafts in overlapping TDC of cylinders 1 or 4
Courtesy of PORSCHE OF NORTH AMERICA, INC.

3. If the camshafts of cylinder bank 1 - 3 are removed, the smaller circular cut-outs at the grooves of the inlet and outlet camshafts **-arrows-** of **cylinder 1** must point to the cylinder head cover. For cylinder bank 4 - 6 the corresponding position is then on **cylinder 4** . Check the position using the **adjusting gauge P 9686**. See **Fig. 63**.

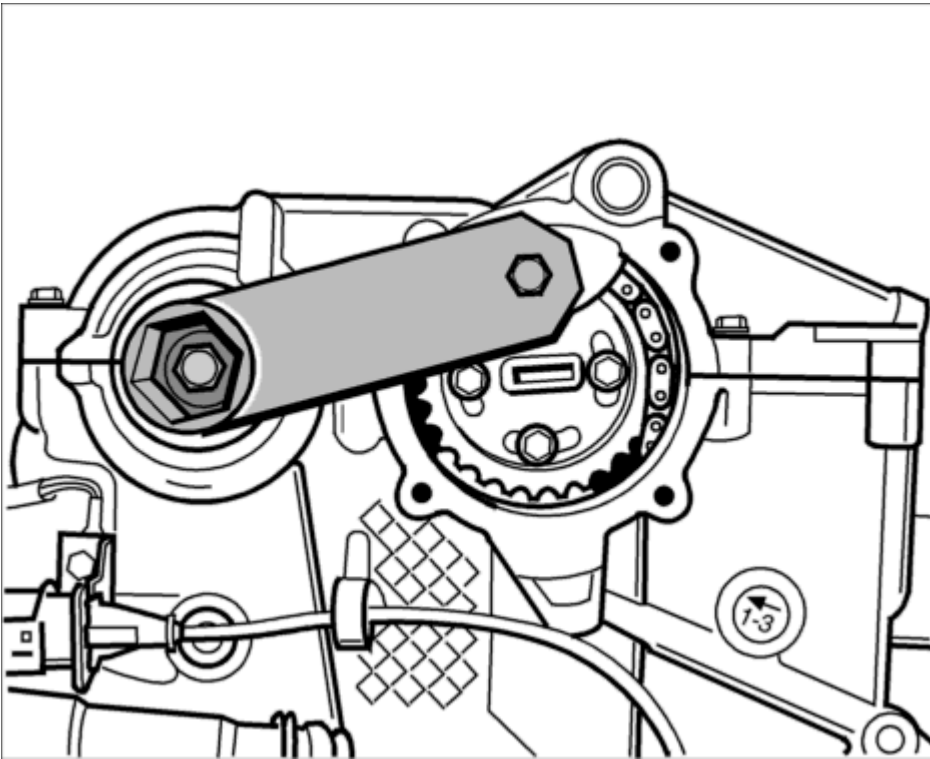


Fig. 64: Unscrew the central screw on the camshaft adjuster.

Courtesy of PORSCHE OF NORTH AMERICA, INC.

NOTE:

- ***Before disassembling the cylinder head cover, it is essential to unscrew the central screw on the camshaft adjustment device.***

4. Unscrew the central screw on the camshaft adjustment device. Position **retaining tool P 9685** on the hexagon of the adapter and place the contact block as a counter on the fitting bore of the cylinder head cover for the oil suction pump; if necessary, position the contact block by undoing and tightening the screw. If the special tool cannot be positioned on the hexagon of the adapter in this way, the engine must be turned further in the direction of rotation at the belt pulley of the crankshaft until the contact block comes into contact with the central screw of the cylinder head cover, ready for unscrewing. Unscrew the central screw.

5. Remove cylinder head cover --> **158220 Removing and installing cylinder head cover - chapter on "Removing"**.

6. Release the four Torx screws M6 x 16 on the sprocket of the respective exhaust camshaft. Do not remove the sprocket.

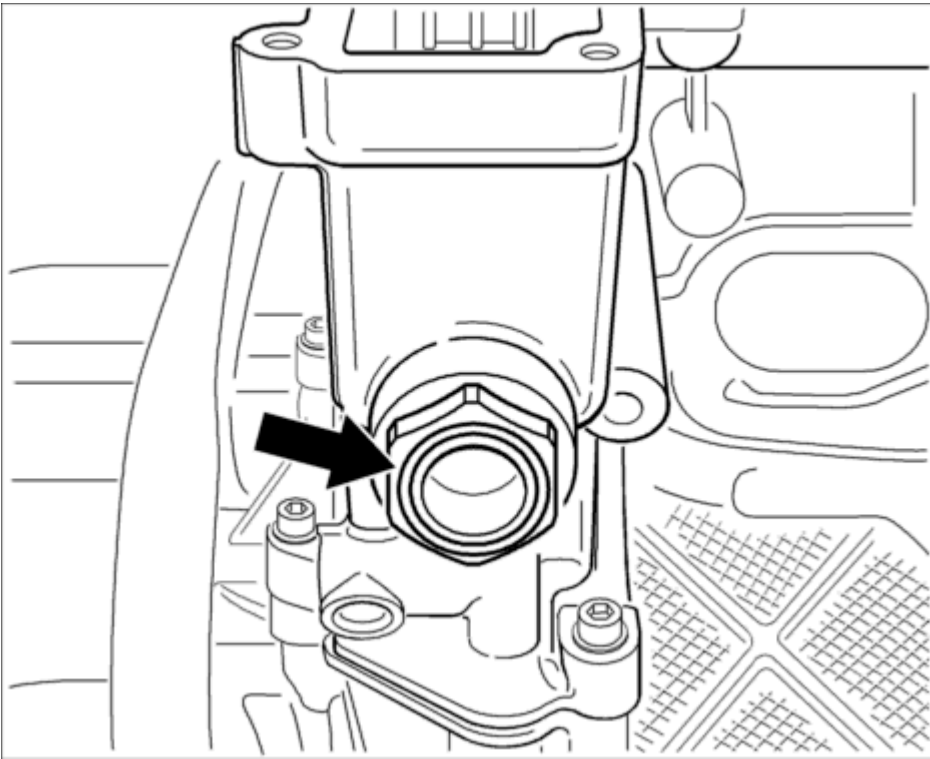


Fig. 65: Chain tensioner, cylinders 1 - 3

Courtesy of PORSCHE OF NORTH AMERICA, INC.

7. Remove chain tensioner for cylinders 1 - 3 or 4 - 6.

Cylinder side 4-6:

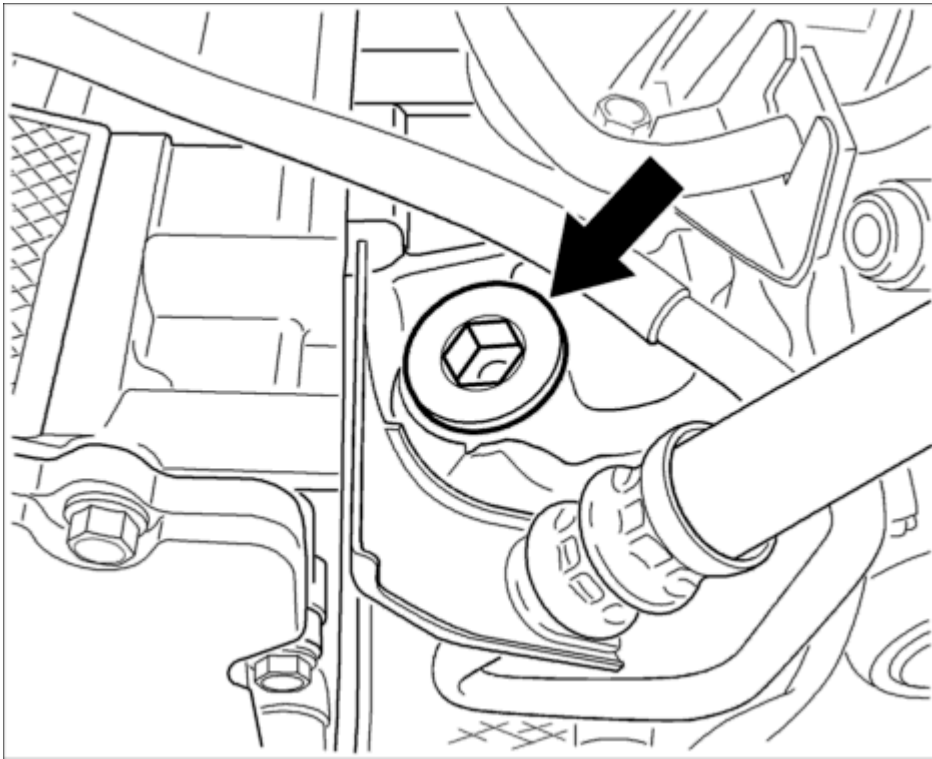


Fig. 66: Chain tensioner, cylinders 4 - 6

Courtesy of PORSCHE OF NORTH AMERICA, INC.

8. Remove the chain tensioner for cylinders 4 - 6.
9. Unscrew the M6 guide rail screw on the pulley side (hexagon socket a/f 5).
10. Turn the engine at the assembly support so that cylinder bank to be worked on stands vertically upwards.
11. Unscrew four Torx screws for exhaust camshaft sprocket. Lift timing chain off sprocket and remove the sprocket. Lay timing chain on the mounting tab for the sprocket.
12. Remove the four camshaft thrust bearings and the guide rail. Unscrew eight Torx screws, six M6 x 35, two M6 x 40 (screws for guide rail). Lift the thrust bearing and the guide rail carefully off the mounting points or timing chain.
13. Remove the camshafts. Remove exhaust camshaft, lift timing chain off the camshaft adjuster of the inlet camshaft and remove the camshaft. Lay the timing chain in the chain housing in the cylinder head.

INSTALLING CAMSHAFT - ENGINE REMOVED

Installing camshaft - engine removed

CAUTION: Risk of damage due to particles of dirt.

- **Oil bores/oil ducts can become blocked up.**

--> When working on the engine, absolute cleanliness is essential.

--> Lay removed engine parts on a clean base and cover them without fail.

--> Use the **cover for dust protection when fitting the engine NR.165** on the engine assembly support.

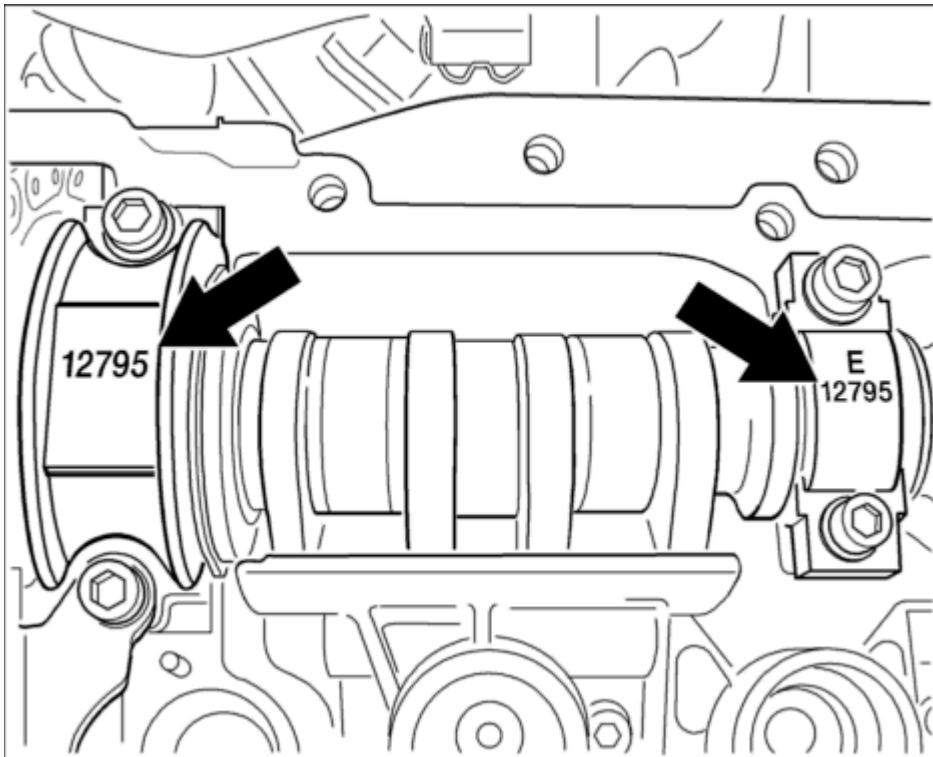


Fig. 67: Identification of camshaft housing:
Courtesy of PORSCHE OF NORTH AMERICA, INC.

Identification of housings of camshafts:

- **Inlet camshaft:**
- **Thrust bearing:** 'E' and matching number on cylinder head/cylinder head cover
- **Housing of bearing sleeve:** only matching number
- **Outlet camshaft:**
- **Thrust bearing on sprocket:** '1A' and matching number on cylinder head/cylinder head cover
- **2nd Thrust bearing:** '2A' and matching number on cylinder head/cylinder head cover

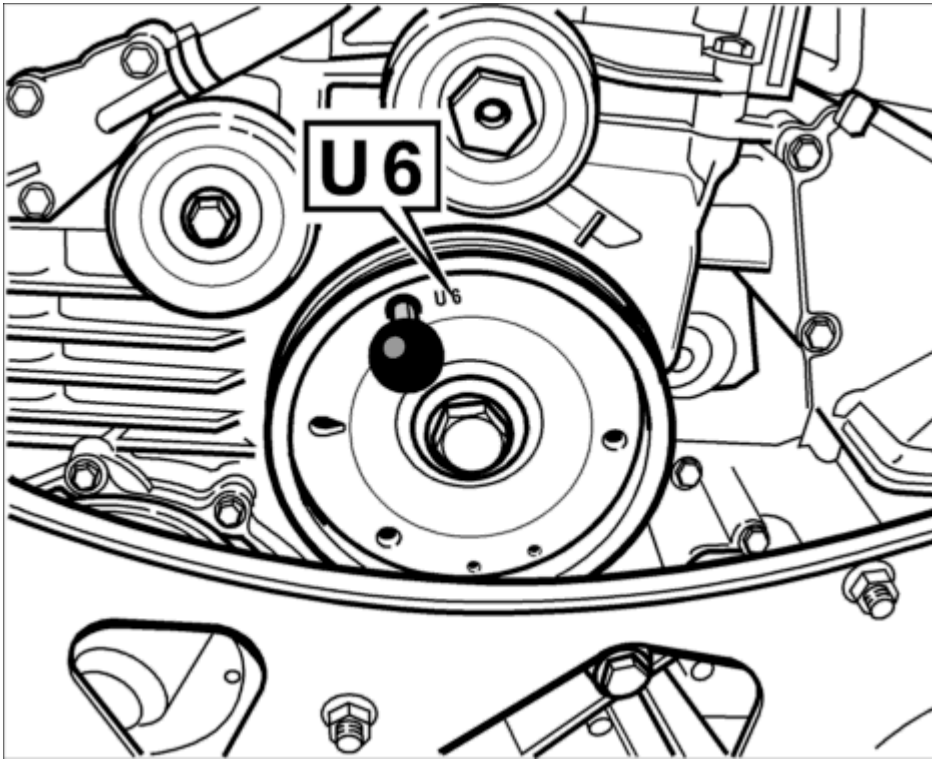


Fig. 68: Pulley fixed at 60° before TDC

Courtesy of PORSCHE OF NORTH AMERICA, INC.

1. To remove the play from the timing chain drive, turn the crankshaft by means of the pulley or vibration balancer **clockwise (running direction of engine to 60° before TDC : marking U6 on pulley or vibration balancer coincides with fixing bore in crankcase** . Fix with **locating pin P 9595/1**.

Assembly of cylinder bank 4 - 6

2. Turn the engine on the assembly support until cylinder bank 4 - 6 stands vertically upwards.
3. Oil the bearing surfaces of the camshafts with new engine oil.

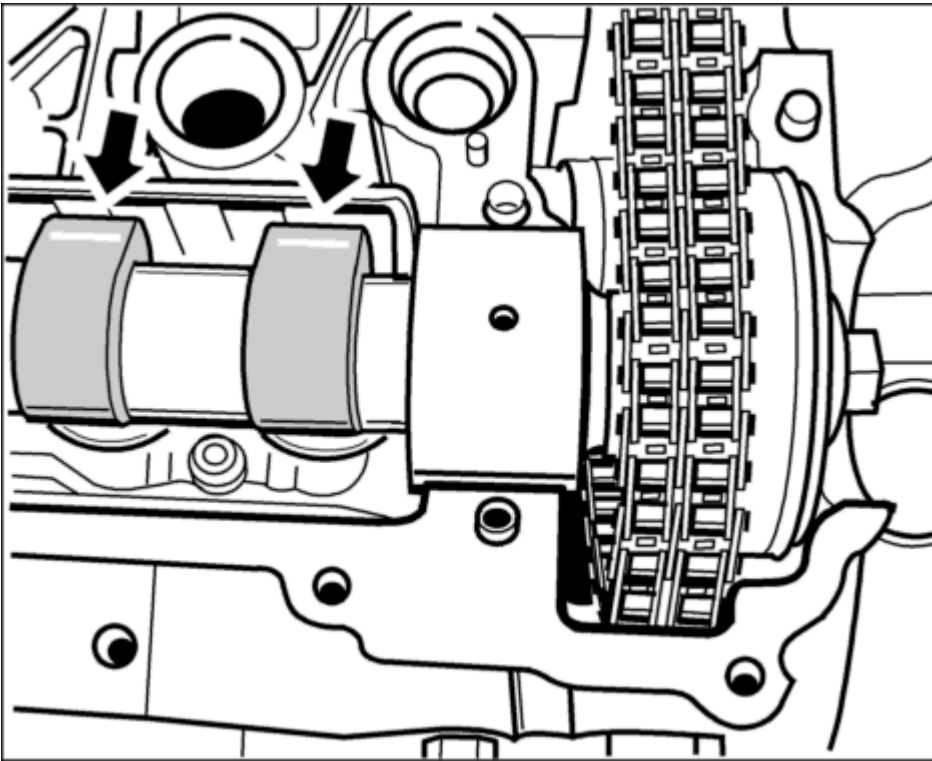


Fig. 69: Cams of cylinder 4 pointing toward bulkhead

Courtesy of PORSCHE OF NORTH AMERICA, INC.

4. Insert inlet camshaft 4-6. Pull the timing chain out of the chain housing of the cylinder head with a welding wire and position on the ring gear of the camshaft adjuster, at the same time inserting the camshaft at overlapping TDC of cylinder 4 (the cams of cylinder 4 point towards the bulkhead of the flat-base tappet housing -arrows-).

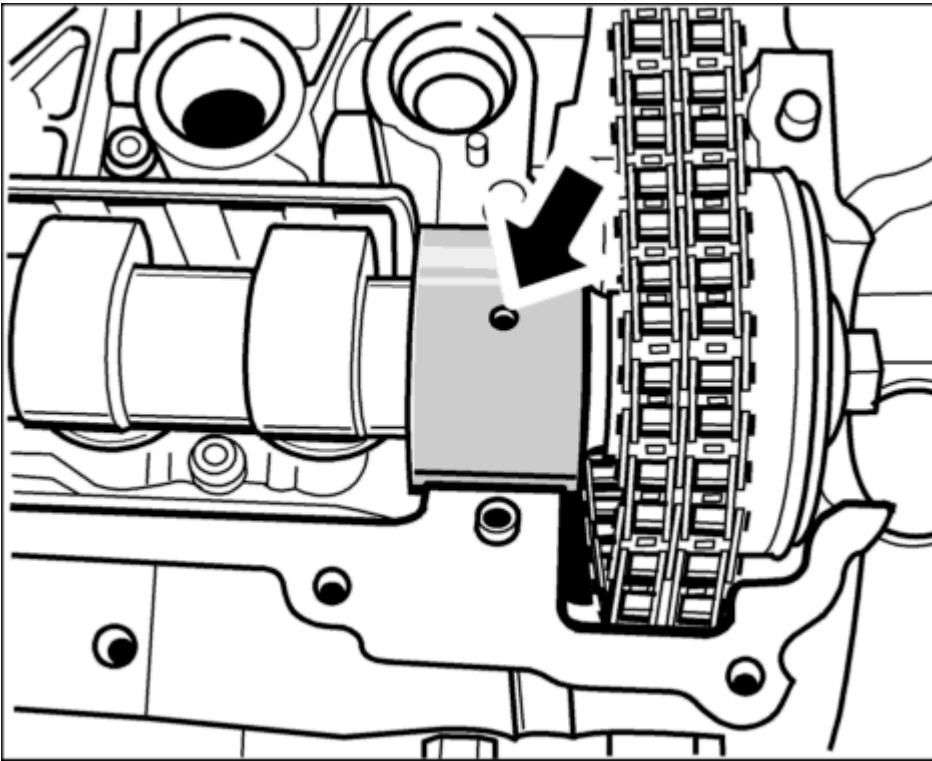


Fig. 70: Position of bearing sleeve for inlet camshaft
Courtesy of PORSCHE OF NORTH AMERICA, INC.

NOTE:

- ***Make sure that the bearing sleeve on the inlet camshaft is positioned correctly.***

5. The bearing sleeve of the inlet camshaft must be positioned so that the centrally bored blind hole points vertically upwards **-arrow-** (the rib of the cylinder head should also be at the center in relation to the bearing sleeve). In this position, the dowel pin in the bearing bore of the cylinder head will fit precisely into the opposite off-center blind hole bore. Any other bores are through-holes for guiding the oil.

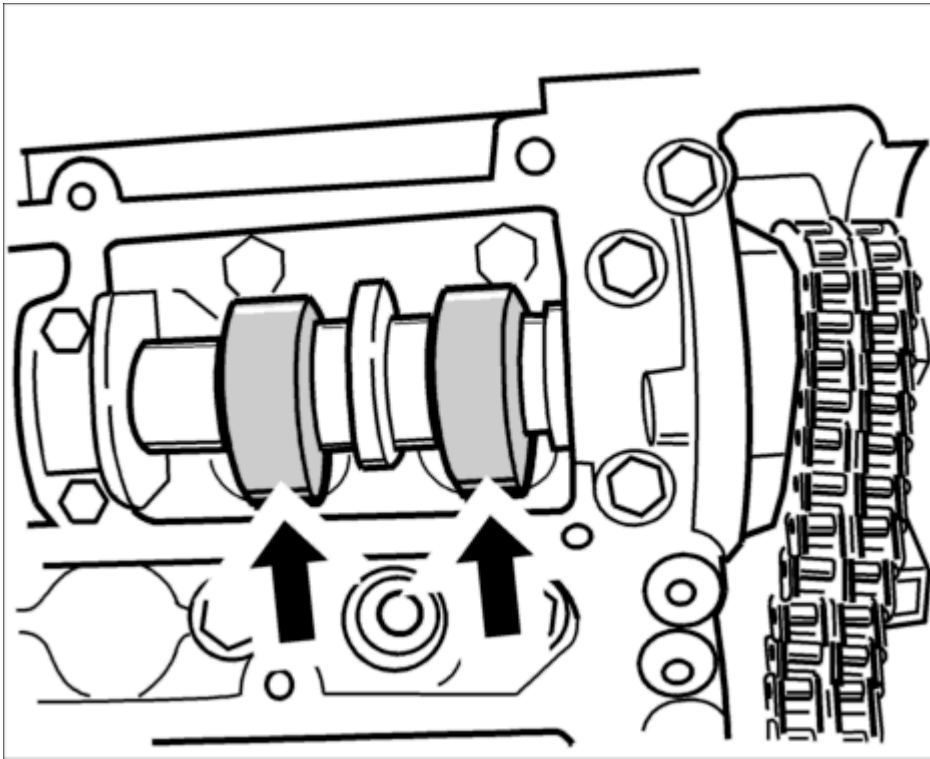


Fig. 71: Exhaust camshaft 4 - 6

Courtesy of PORSCHE OF NORTH AMERICA, INC.

6. Insert exhaust camshaft 4-6. Lay the timing chain on the flange for the sprocket, then insert the camshaft at overlapping TDC of cylinder 4 (the outlet cams of cylinder 4 point towards the cams of the inlet camshaft - **arrows-**). See **Fig. 71**.

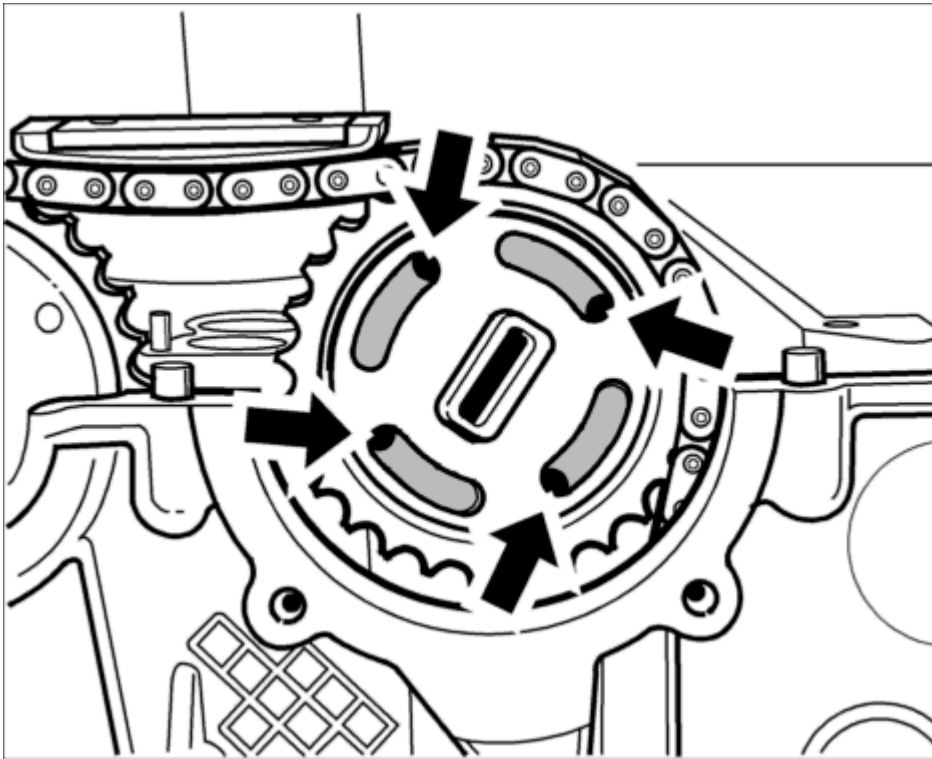


Fig. 72: Position of sprocket 4 - 6 at 60° before TDC
Courtesy of PORSCHE OF NORTH AMERICA, INC.

7. Insert exhaust camshaft sprocket in the timing chain and position on camshaft flange. The four threaded bores in the camshaft flange must be covered approximately half way by the slots of the sprocket **in the clockwise running direction of the engine -arrows-** . See **Fig. 72**.

8. Oil the bearing surfaces of the camshafts with new engine oil.

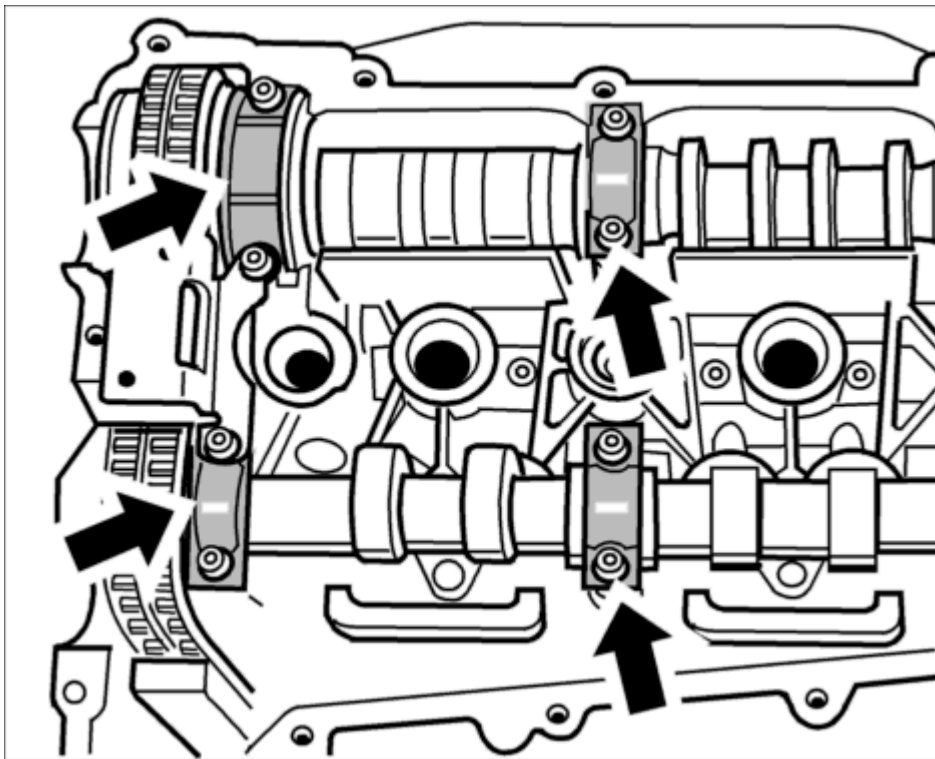


Fig. 73: Installation position of housing

Courtesy of PORSCHE OF NORTH AMERICA, INC.

NOTE:

- ***Do not interchange the thrust bearings of the inlet and exhaust camshafts during assembly; observe identification markings.***

9. Insert three thrust bearings and one housing **-arrows-** for the bearing sleeve of the camshafts together with the guide rail for the timing chain. See **Fig. 73**.

10. Insert eight housing screws (Torx): six M6 x 35 and two M6 x 40 for camshaft bearing and guide rail. Tighten screws evenly and just hand-tight.

Adjust timing, cylinder bank 4 - 6

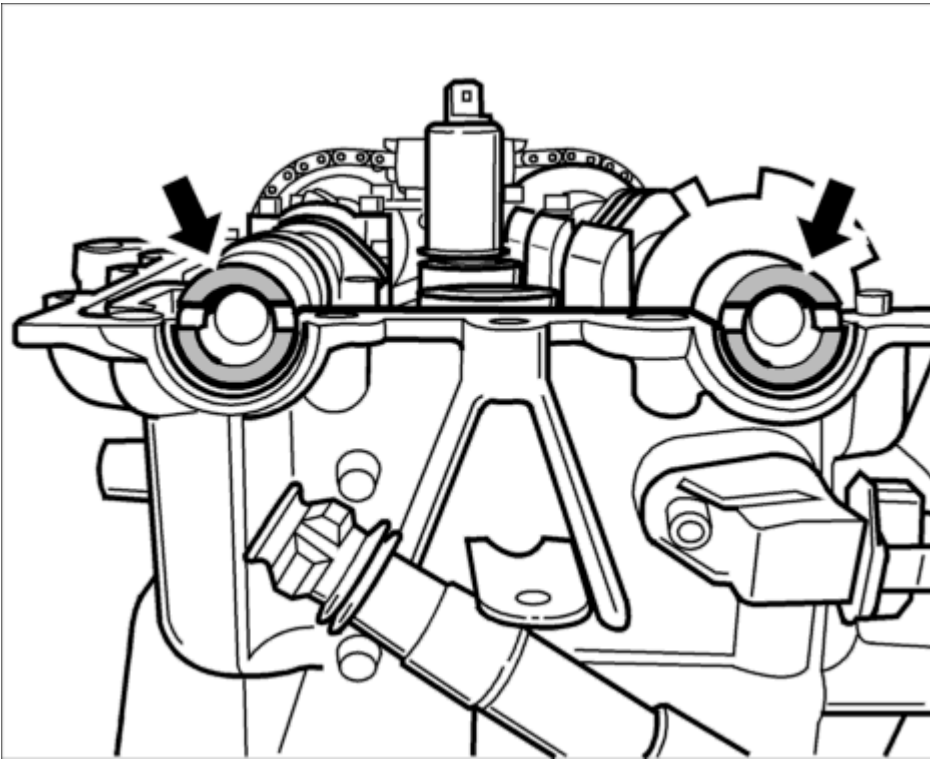


Fig. 74: Slot position of camshafts at overlap
Courtesy of PORSCHE OF NORTH AMERICA, INC.

11. Align both camshafts. The small circular cut-outs must point upwards **-arrows-** . See **Fig. 74**.

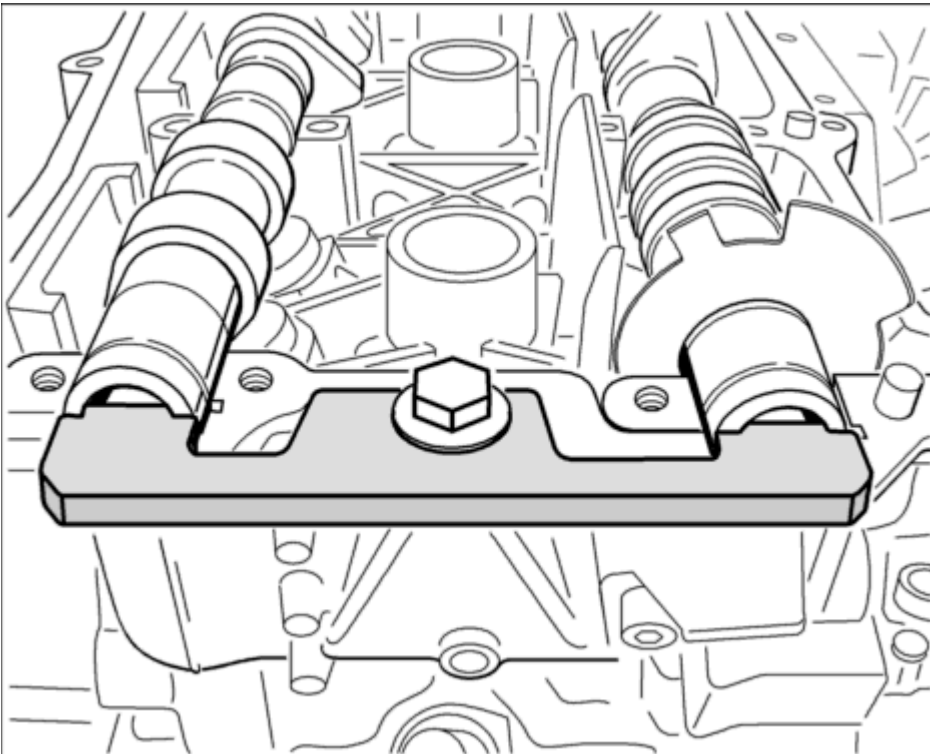


Fig. 75: Position of adjusting gauge 9689

Courtesy of PORSCHE OF NORTH AMERICA, INC.

12. Using special tool **adjusting gauge P 9686**, fix camshafts (if necessary with the gauge twisted) with an M8 screw (e. g. hexagon-head bolt M8 x 16). The flat tool face points upwards. Screw in fastening screw by hand.

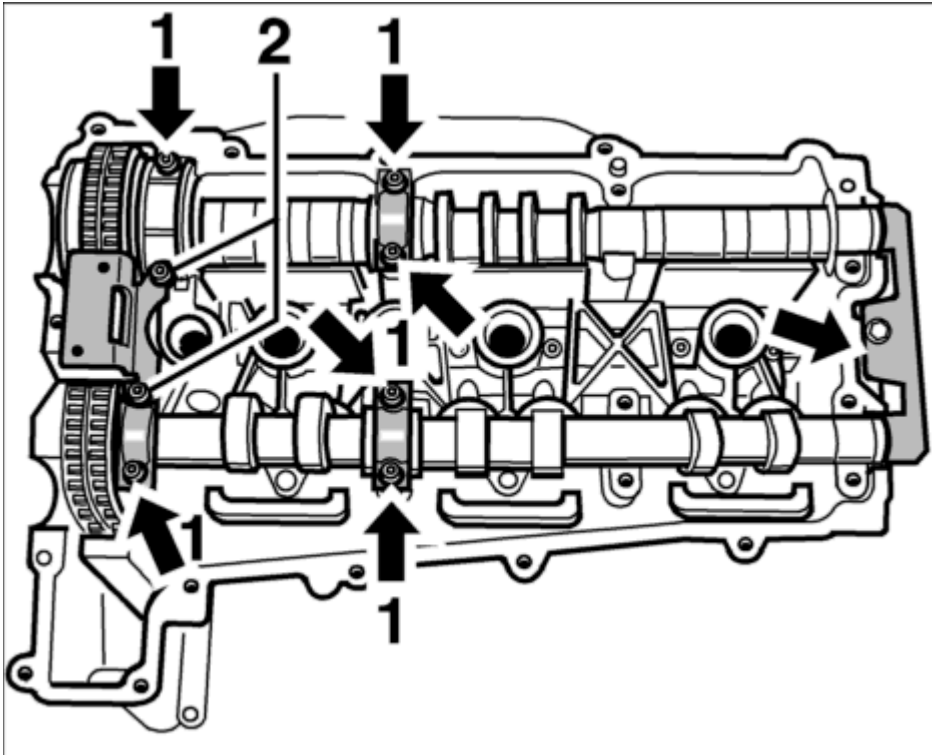


Fig. 76: Housing screws and adjusting gauge

Courtesy of PORSCHE OF NORTH AMERICA, INC.

13. Screw the housing screws of the inlet and exhaust camshafts and the auxiliary screw of the adjustment gauge alternately by approx. another 90° until the specified tightening torque is reached. --> **Tightening torque: 7.5 ftlb.** ; --> **Tightening torque: 17 ftlb.**

14. Insert guide rail screw with a new O-ring and tighten (hexagon socket M6, a/f 5) Grease O-ring with Optimol MP3. --> **Tightening torque: 7.5 ftlb.**

2007 Porsche Boxster

ENGINE Cylinder head, valve drive - Boxster And Cayman

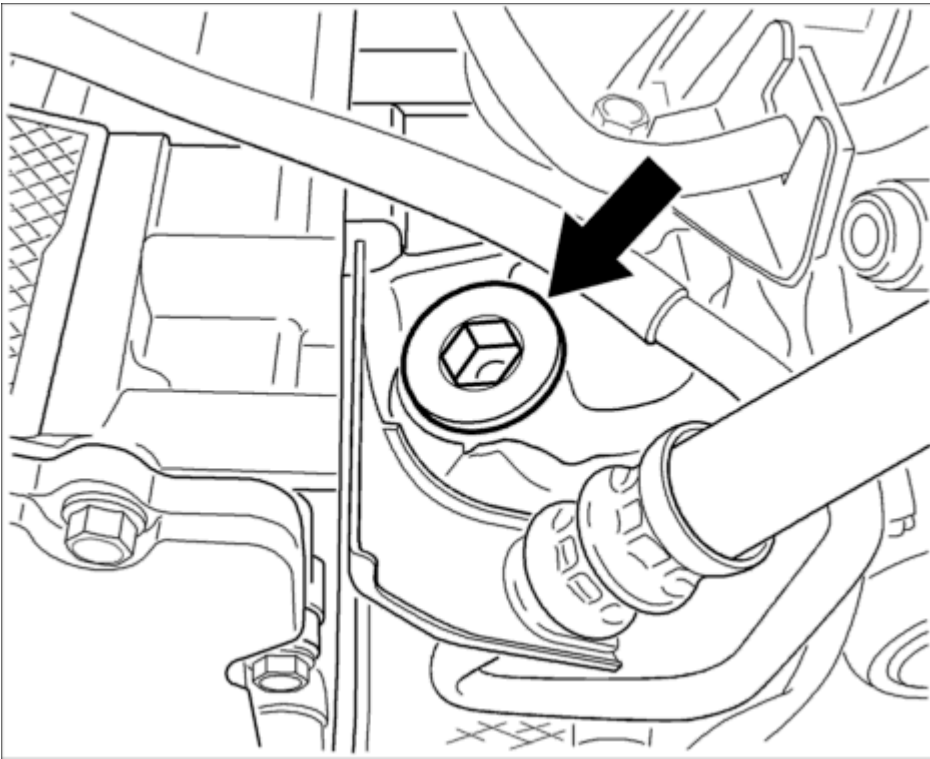


Fig. 77: Chain tensioner, cylinders 4 - 6

Courtesy of PORSCHE OF NORTH AMERICA, INC.

15. Fit the chain tensioner, side 4-6 (hexagon socket a/f 14). Fit chain tensioner with new aluminum sealing ring and tighten. --> **Tightening torque: 59 ftlb.**

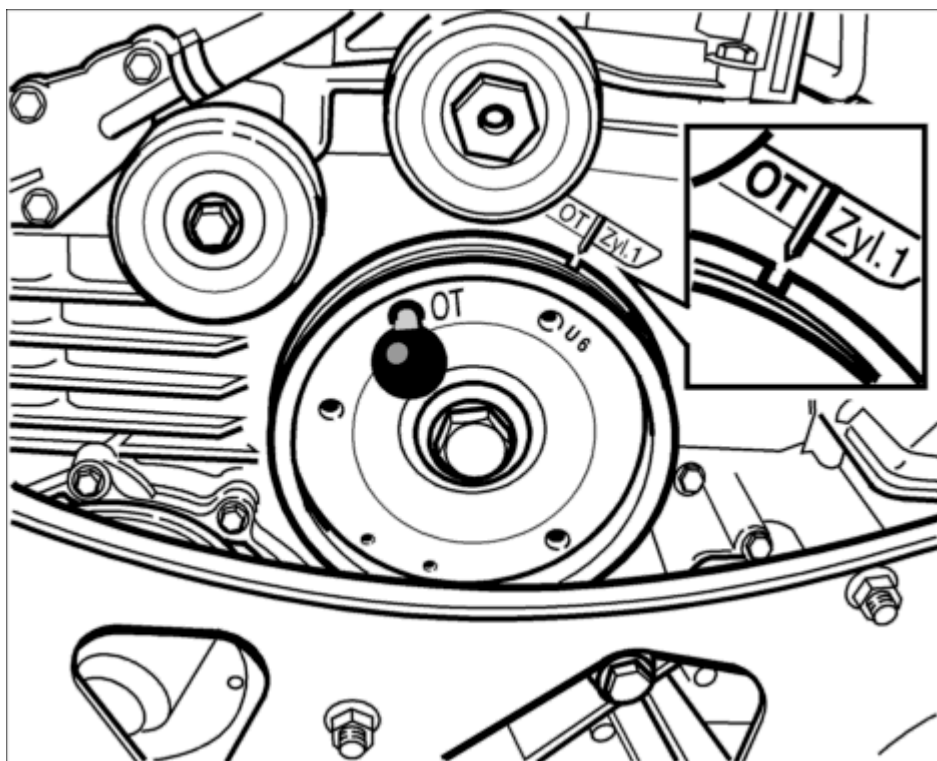


Fig. 78: Pulley fixed at TDC marking

Courtesy of PORSCHE OF NORTH AMERICA, INC.

NOTE:

- *Position crankshaft above the pulley or vibration balancer before final adjustment of the timing to the TDC marking.*

16. Turn the crankshaft by means of the pulley or vibration balancer **clockwise (running direction of engine to TDC mark : TDC marking on pulley or vibration balancer coincides with fixing bore in crankcase . Fix with locating pin P 9595/1.**

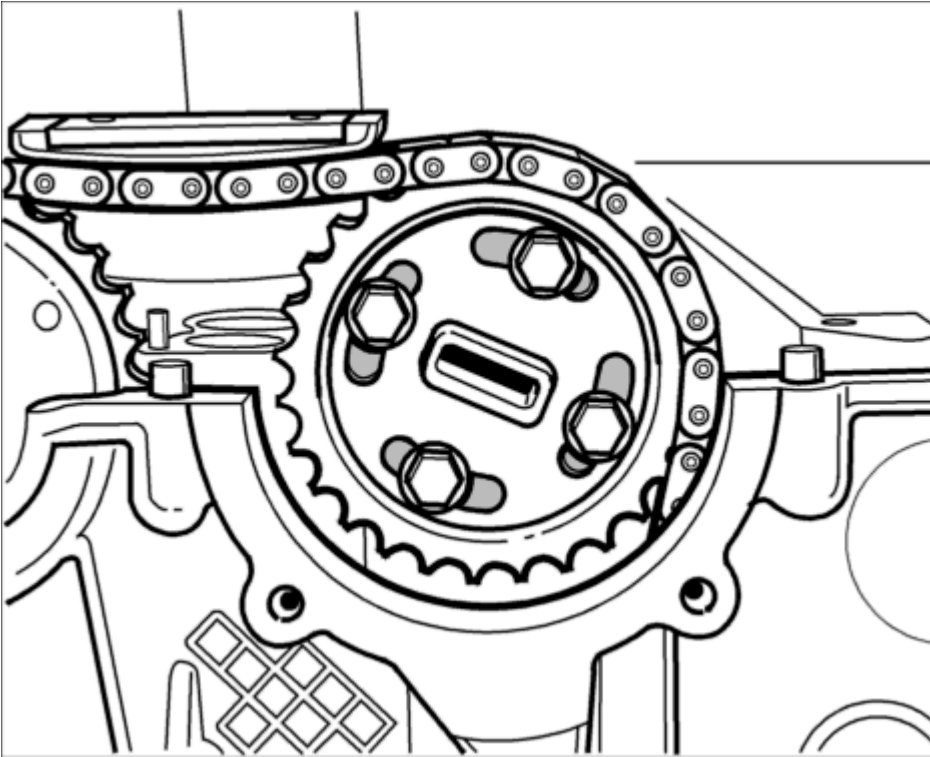


Fig. 79: Exhaust camshaft sprocket tightened
Courtesy of PORSCHE OF NORTH AMERICA, INC.

17. Insert four Torx screws M6 to sprocket of exhaust camshaft and tighten evenly in diagonally opposite sequence. --> **Tightening torque: 10.5 ftlb.**

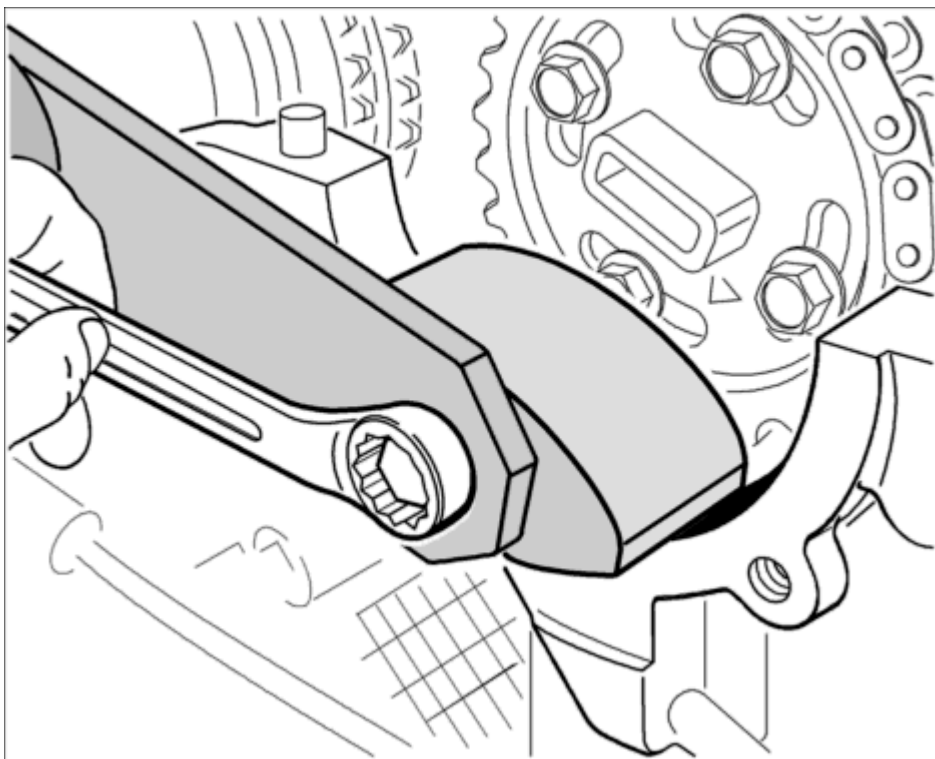


Fig. 80: Contact block at the fitting bore of the cylinder head

Courtesy of PORSCHE OF NORTH AMERICA, INC.

18. Tighten the central screw of the camshaft adjusting device. Fit special tool **retaining tool P 9685** on hexagon of intermediate piece of the central screw. Screw in the central screw gently by hand so that the loose contact block just touches the fitting bore of the oil suction pump. Fix the hexagon-head bolt to the contact block.

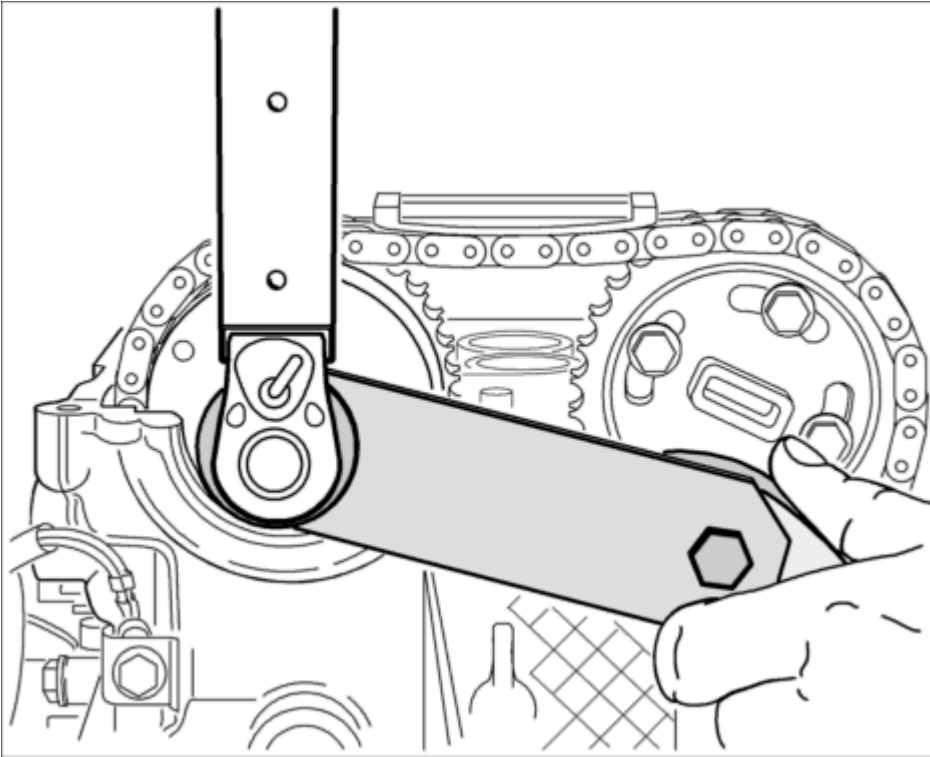


Fig. 81: Tighten central screw of camshaft adjusting device.

Courtesy of PORSCHE OF NORTH AMERICA, INC.

NOTE:

- ***Before final tightening (torque angle) of the central screw, the special tool adjusting gauge P 9686 must be removed.***

19. Tighten the central screw in two stages. Initial tightening to the specified torque. --> **Initial tightening: 37 ftlb.**

20. Remove special tool **adjustment gauge P 9686**. Undo the M8 screw and remove gauge.

21. Tighten central screw with torque angle wrench. --> **Final tightening torque angle: 110 °**

Assembly of cylinder bank 1-3

22. Turn the engine on the assembly support until cylinder bank 1 - 3 stands vertically upwards.

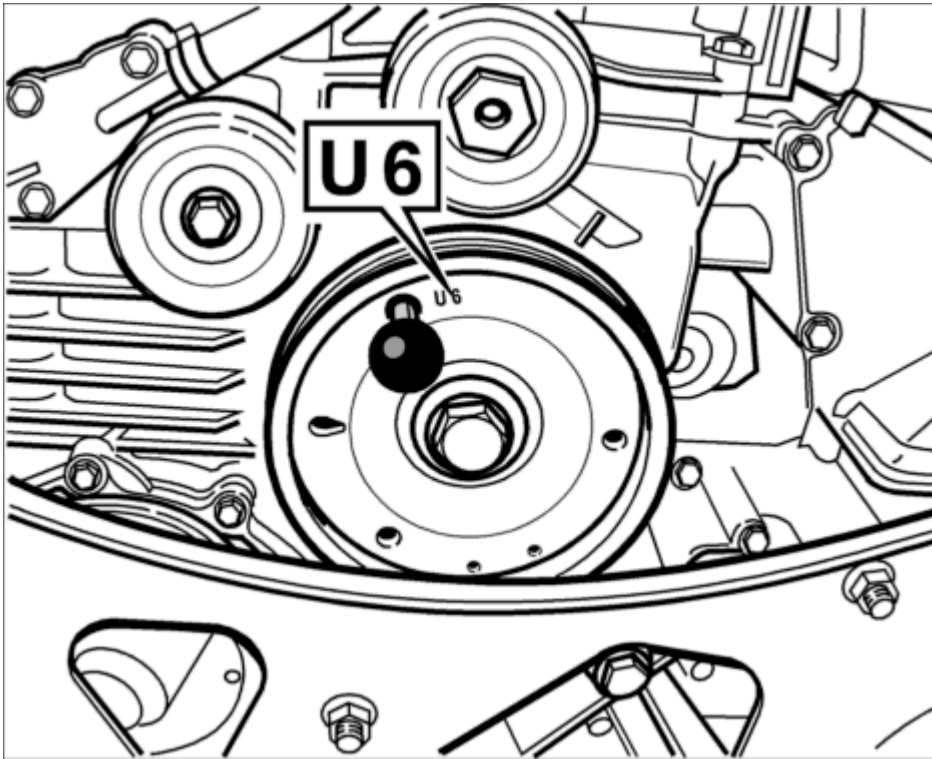


Fig. 82: Pulley fixed at 60° before TDC

Courtesy of PORSCHE OF NORTH AMERICA, INC.

23. Turn the crankshaft by means of the pulley or vibration balancer **clockwise (running direction of engine)** further still until the **marking U6 on pulley or vibration balancer coincides with fixing bore in crankcase (60° before TDC)**. Fix with **locating pin P 9595/1**.

24. Oil the bearing surfaces of the camshafts with new engine oil.

2007 Porsche Boxster

ENGINE Cylinder head, valve drive - Boxster And Cayman

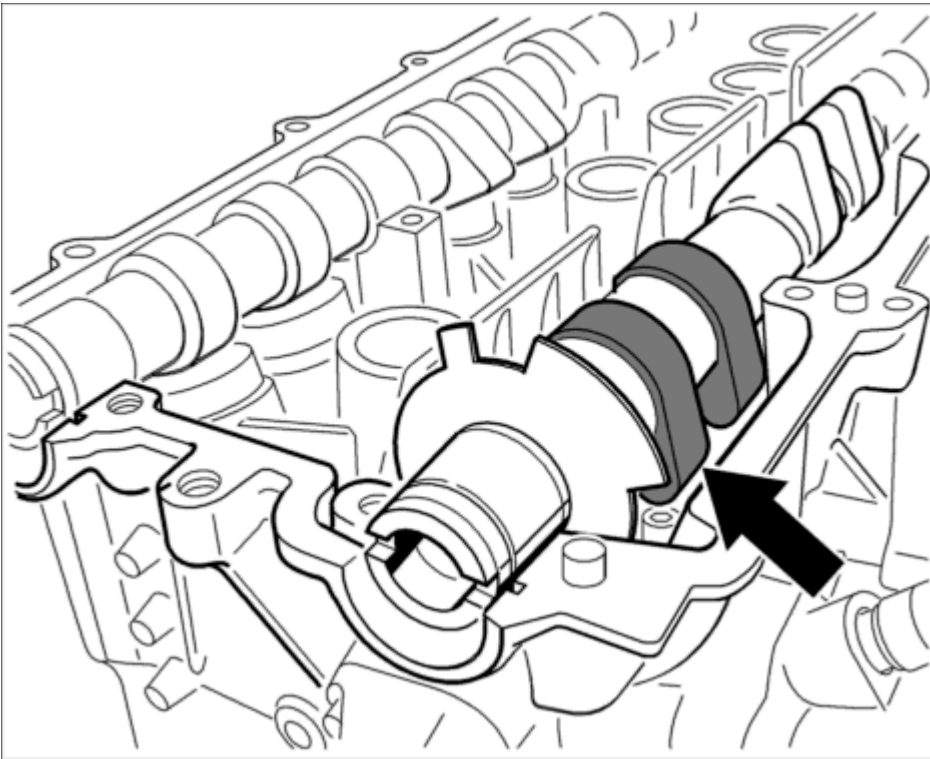


Fig. 83: Inlet camshaft 1-3 in overlap

Courtesy of PORSCHE OF NORTH AMERICA, INC.

25. Insert inlet camshaft 1-3. Pull the control chain out of the chain housing of the cylinder head with a welding wire and position on the toothed ring of the camshaft adjuster. Then insert the camshaft at overlapping TDC of cylinder 1 (the cams of cylinder 1 point diagonally downwards towards the outside of the cylinder head **-arrow-**).

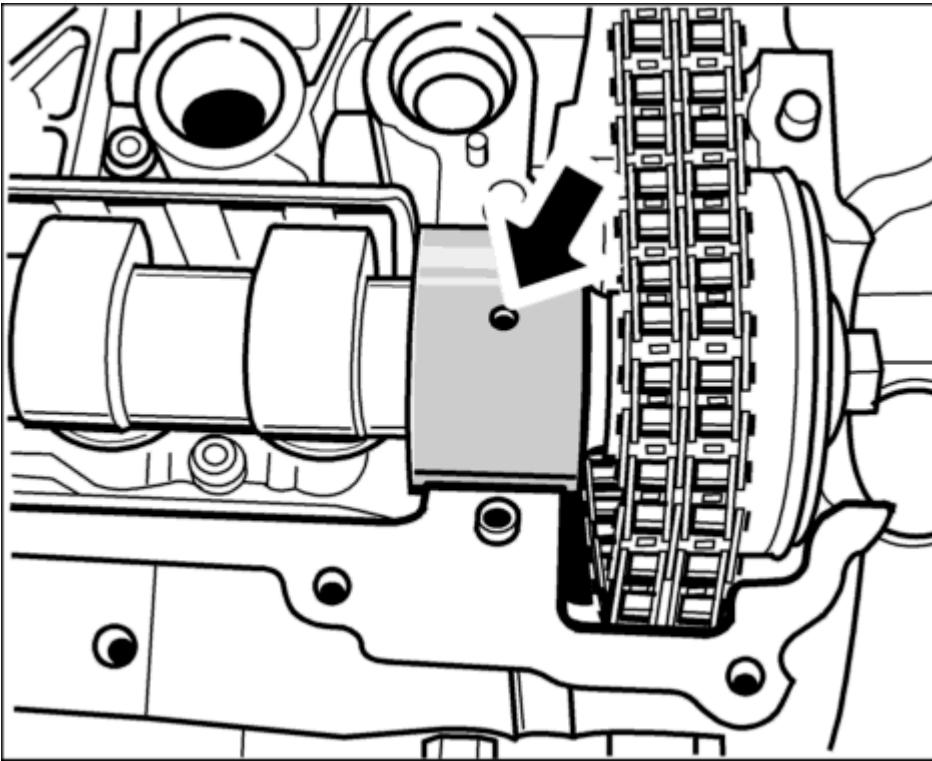


Fig. 84: Position of bearing sleeve for inlet camshaft
Courtesy of PORSCHE OF NORTH AMERICA, INC.

NOTE:

- ***Make sure that the bearing sleeve on the inlet camshaft is positioned correctly.***

26. The bearing sleeve of the inlet camshaft must be positioned so that the centrally bored blind hole points vertically upwards **-arrow-** (the rib of the cylinder head should also be at the center in relation to the bearing sleeve). In this position, the dowel pin in the bearing bore of the cylinder head will fit precisely into the opposite off-center blind hole bore. Any other bores are through-holes for guiding the oil.

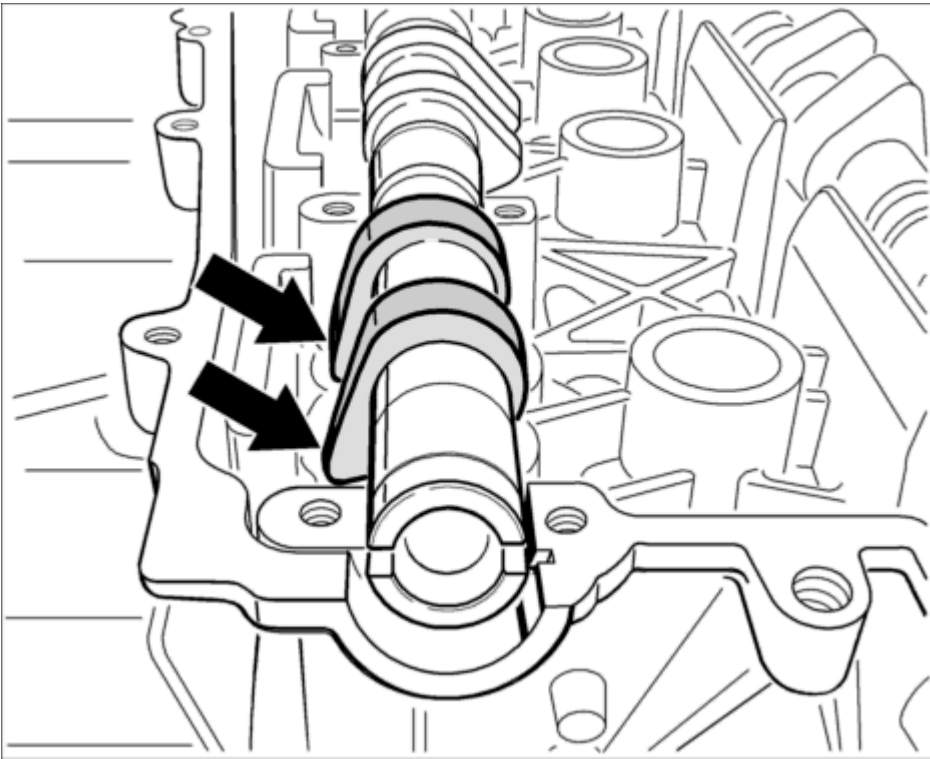


Fig. 85: Exhaust camshaft 1-3 in overlap

Courtesy of PORSCHE OF NORTH AMERICA, INC.

27. Insert exhaust camshaft 1 - 3. Lay the control chain on the flange for the chain sprocket, then insert the camshaft at overlapping TDC of cylinder 1 (the cams of cylinder 1 point diagonally downwards towards the outside of the cylinder head).

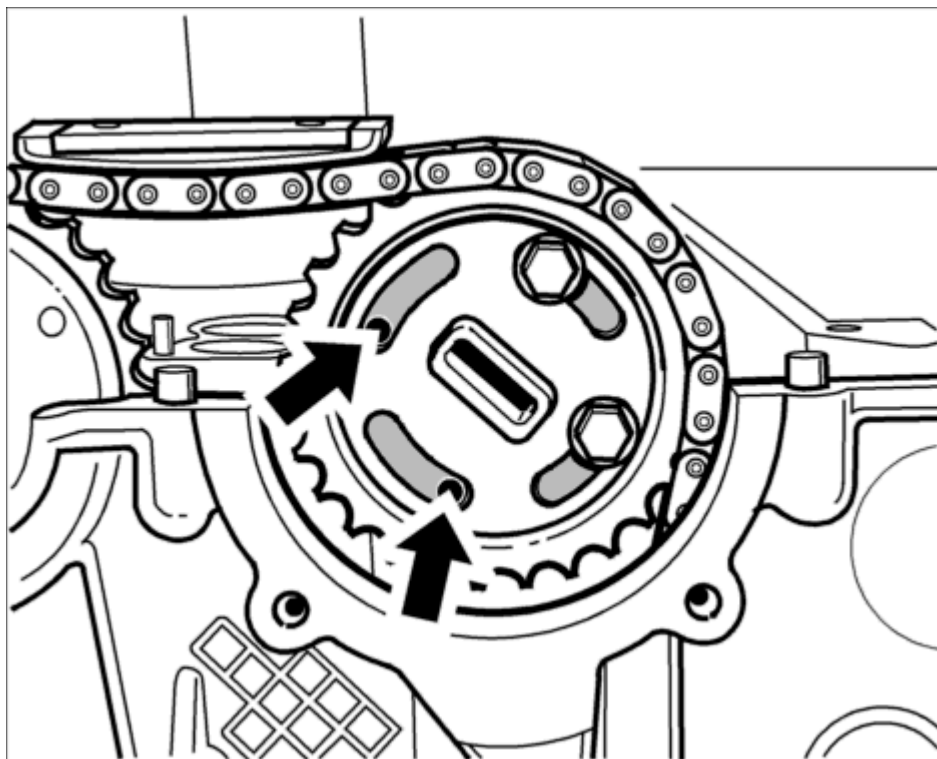


Fig. 86: Exhaust sprocket 1 - 3 at 60° before TDC

Courtesy of PORSCHE OF NORTH AMERICA, INC.

28. Insert exhaust camshaft sprocket in the timing chain and position on camshaft flange. The four threaded bores in the camshaft flange must be fully visible **on the left at the slotted curves of the sprocket -arrows-** so that the M6 x 12 Torx screws can still be positioned to fasten the sprocket. See **Fig. 86**.

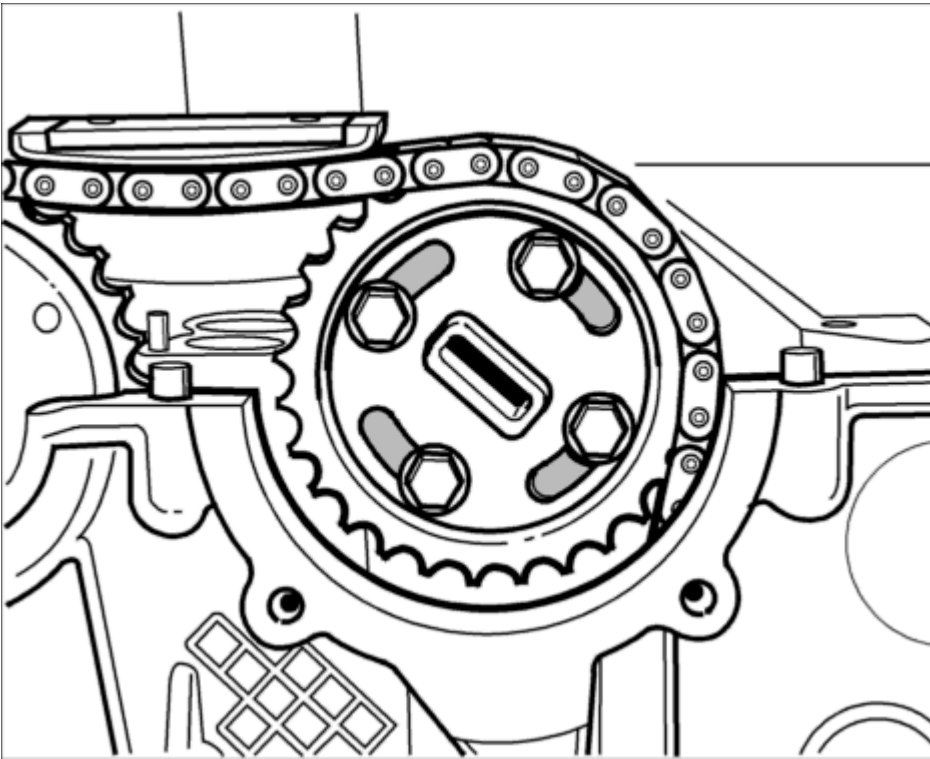


Fig. 87: Exhaust sprocket 1 - 3, all screws fitted
Courtesy of PORSCHE OF NORTH AMERICA, INC.

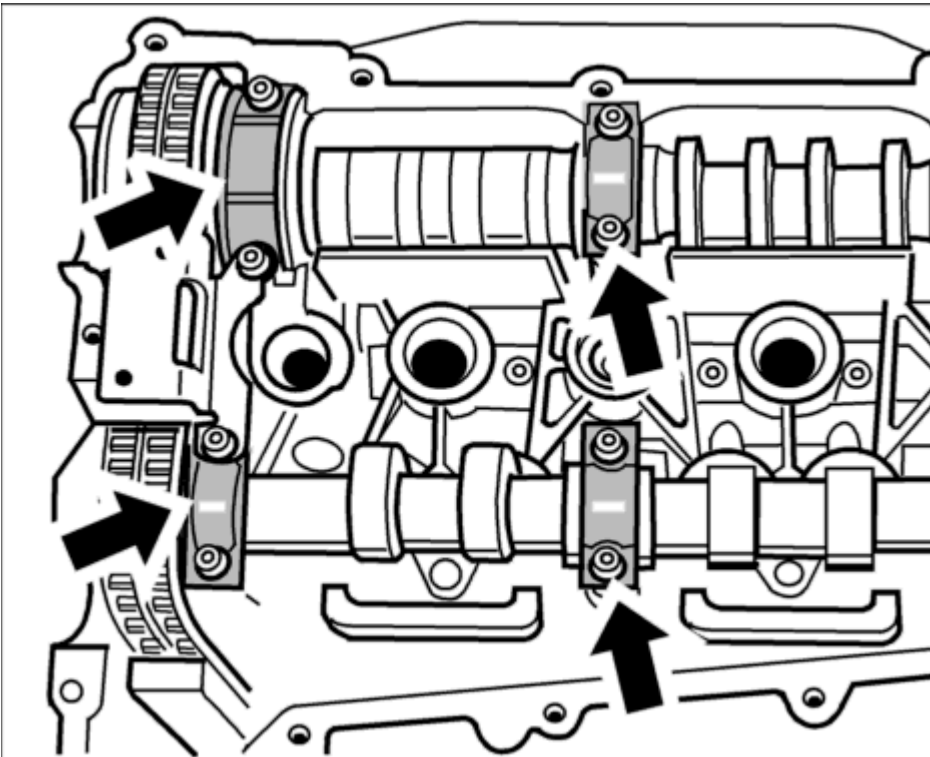


Fig. 88: Installation position of housing
Courtesy of PORSCHE OF NORTH AMERICA, INC.

NOTE:

- ***Do not interchange the thrust bearings of the inlet and exhaust camshafts during assembly; observe identification markings.***

29. Insert three thrust bearings and one housing **-arrows-** for the bearing sleeve of the camshafts together with the guide rail for the timing chain. See **Fig. 88**.

30. Insert eight housing screws (Torx): six M6 x 35 and two M6 x 40 for camshaft bearing and guide rail. Tighten screws evenly and just hand-tight.

Adjust timing, cylinder bank 1-3**NOTE:**

- ***Position crankshaft above the pulley or vibration balancer before final adjustment of the timing to the TDC marking.***

NOTE:

- ***Before final tightening (torque angle) of the central screw, the special tool adjusting gauge P 9686 must be removed.***

31. Final timing adjustment for cylinder bank 1-3 is analogous to that for cylinder bank 4-6 ;.

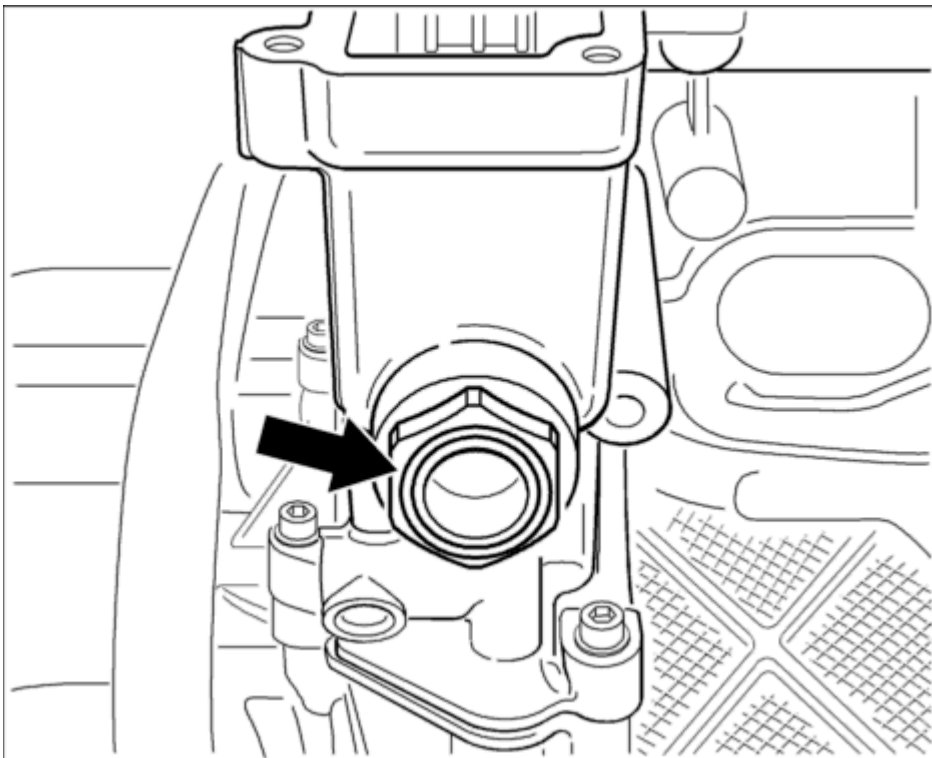


Fig. 89: Chain tensioner, cylinders 1 - 3

Courtesy of PORSCHE OF NORTH AMERICA, INC.

32. Fit chain tensioner for side 1-3 (hexagon a/f 32) before turning crankshaft to the TDC mark. Fit chain

tensioner with new sealing ring and tighten. --> **Tightening torque: 59 ftlb.**

After adjusting the timing, this should be re-checked.

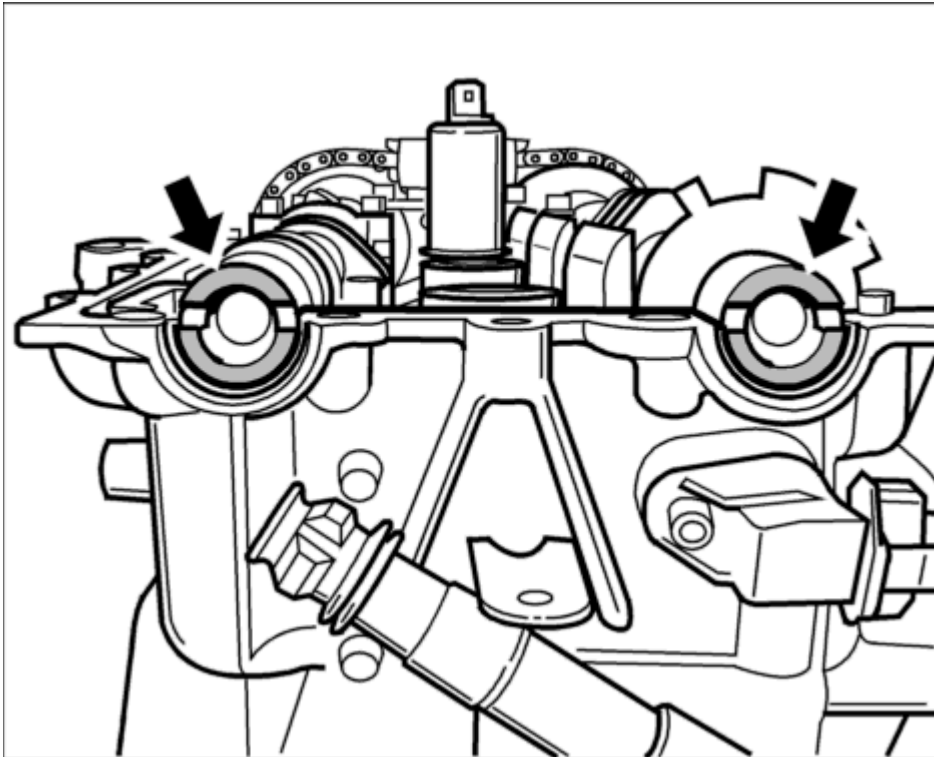


Fig. 90: Slot position of camshafts at overlap

Courtesy of PORSCHE OF NORTH AMERICA, INC.

33. Turn the engine 360° at the crankshaft and fix at the TDC mark. Check camshaft position of cylinder bank 4 - 6 using the **adjusting gauge P 9686**. Then turn a further 360° and check the camshaft position of cylinder bank 1 - 3.

SUBSEQUENT WORK FOR INSTALLING CAMSHAFTS

Subsequent work for installing camshafts

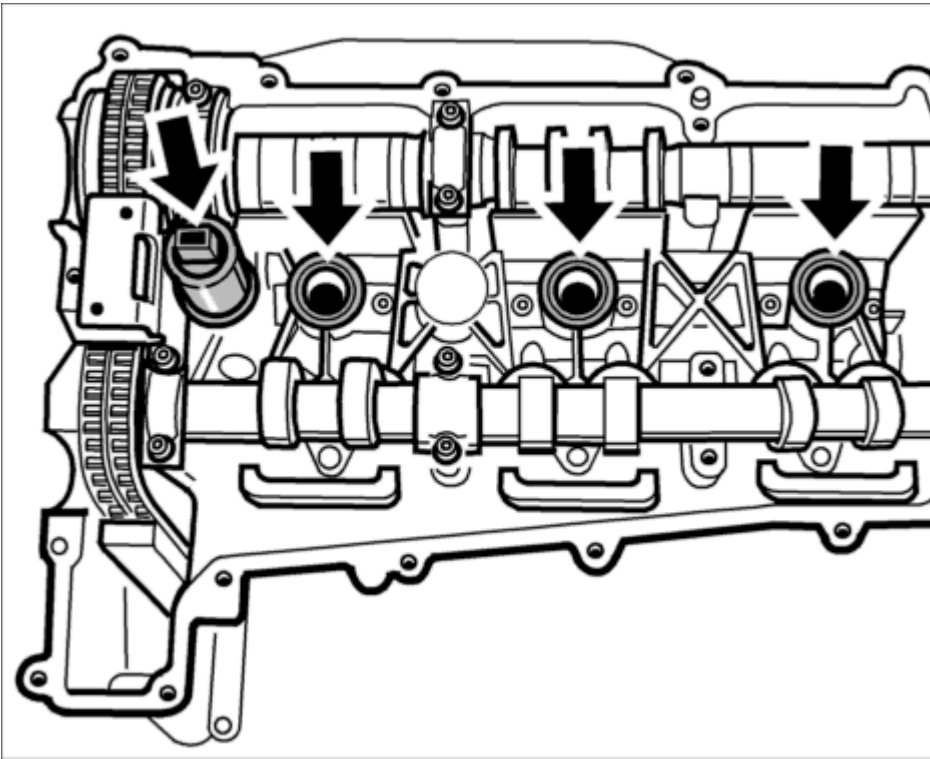


Fig. 91: Spark plug recess gaskets and solenoid hydraulic valve for camshaft timing
 Courtesy of PORSCHE OF NORTH AMERICA, INC.

1. Insert solenoid hydraulic valves and new gaskets for the spark-plug recesses. Fit new O-rings into the solenoid hydraulic valves and insert into the bores in the cylinder head (if necessary replace oil strainer). Grease O-rings with Optimol MP3 --> **153719 Removing and installing solenoid hydraulic valve for camshaft timing - chapter on "Installing"**.
2. Install cylinder head cover --> **158220 Removing and installing cylinder head cover - engine removed - chapter on "installing"**.
3. Fit oil suction pump (1 - 3) and tandem pump (4 - 6) with new, micro-self-locking Torx screws M6. Replace O-rings and grease with Optimol MP3. Fit vacuum line with new O-rings at tandem pump. --> **Tightening torque: 7.5 ftlb.**
4. Fit new plastic cap dry on cylinder head. Tap in with a plastic hammer.
5. Fit ground strap to cylinder head 1 - 3 with Torx screw M8 x 20 and tighten. --> **Tightening torque: 17 ftlb.**

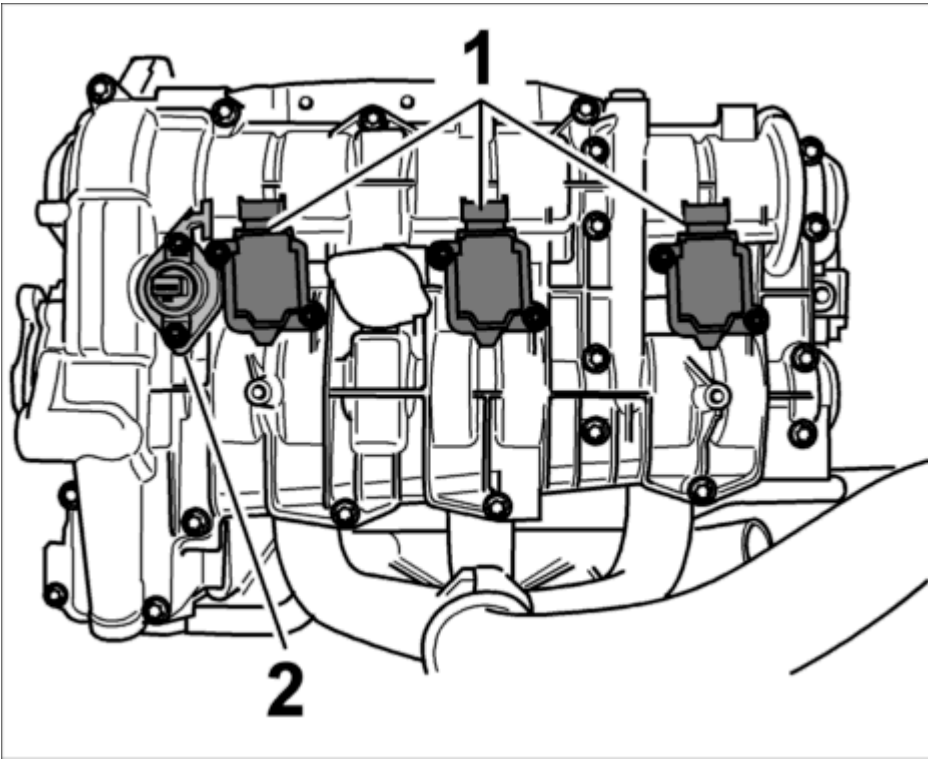


Fig. 92: Hydraulic valves for camshaft adjustment and ignition coils

Courtesy of PORSCHE OF NORTH AMERICA, INC.

6. Insert each ignition coil into its spark plug recess -1- , fit two M6 x 25 Torx socket screws and tighten. --> **Tightening torque: 7.5 ftlb. . See Fig. 92.**

7. Fit new retainer plates and holder for the solenoid hydraulic valves -2- --> **153719 Removing and installing solenoid hydraulic valve for camshaft timing - chapter on "Installing". --> Tightening torque: 7.5 ftlb. . See Fig. 92.**

8. Connect cable plugs to the oil temperature switch for cylinder bank 1 - 3.

15 21 19 REMOVING AND INSTALLING BEARING COVER FOR INTERMEDIATE SHAFT - AS OF MY 2005 (BOXSTER, BOXSTER RHD, BOXSTER S, BOXSTER S RHD)

TOOLS

Designation	Type	Number	Explanation	
socket wrench	special tool	P 9110		
fixing pins	special tool	P 9595/1		
puller	special tool	P 9673		
adjusting gauge	special tool	P 9686		

PRELIMINARY WORK FOR BEARING COVER FOR INTERMEDIATE SHAFT

2007 Porsche Boxster

ENGINE Cylinder head, valve drive - Boxster And Cayman

Preliminary work for bearing cover for intermediate shaft

NOTE:

- *Note the work instructions for disconnecting and reconnecting the battery.*

1. Disconnect the battery --> **27 06 IN WORK INSTRUCTIONS AFTER DISCONNECTING THE BATTERY - AS OF MY 2005 (ALL MODELS)** .

2. Drain engine oil. Refer to **17 01 55 Engine oil and oil filter change - as of MY 2005 (All Models)** .

Tiptronic:

3. Remove automatic transmission. Refer to **37 35 19 Removing and installing automatic transmission - as of MY 2005 (Boxster S, Boxster S RHD)** . Refer to **37 35 19 Removing and installing automatic transmission - as of MY 2005 (Boxster, Boxster RHD)** .

4. Remove drive plate for converter. Refer to **13 63 19 Removing and installing drive plate for converter - as of MY 2005 (All Models)** .

Manual transmission:

5. Remove manual transmission. Refer to **34 35 19 Removing and installing transmission - as of MY 2005 (All Models)** .

6. Remove clutch. Refer to **30 50 19 Removing and installing clutch - as of MY 2005 (All Models)** .

7. Remove double-mass flywheel. Refer to **13 60 19 Removing and installing flywheel - as of MY 2005 (All Models)** .

REMOVING BEARING COVER FOR INTERMEDIATE SHAFT

Removing bearing cover for intermediate shaft

CAUTION: Timing chain may jump over.

- **Risk of engine damage**

--> Following removal of the chain tensioner, the crankshaft must not be turned under any circumstances.

NOTE:

- *For checking with the adjusting gauge, the timing adjustment must be correct.*

NOTE:

- *To make it easier to remove the bearing cover, spray the sealing surface with anti-rust agent.*

NOTE:

- *Remove bearing cover using special tool*

- ***After removing the bearing cover, do not press the threaded bolts of the intermediate shaft.***

puller P 9673. If this is not available, lever the bearing cover out carefully with two screwdrivers so as not to damage the sealing surfaces. Turning several times to the left and right loosens the bearing cover.

Bearing cover

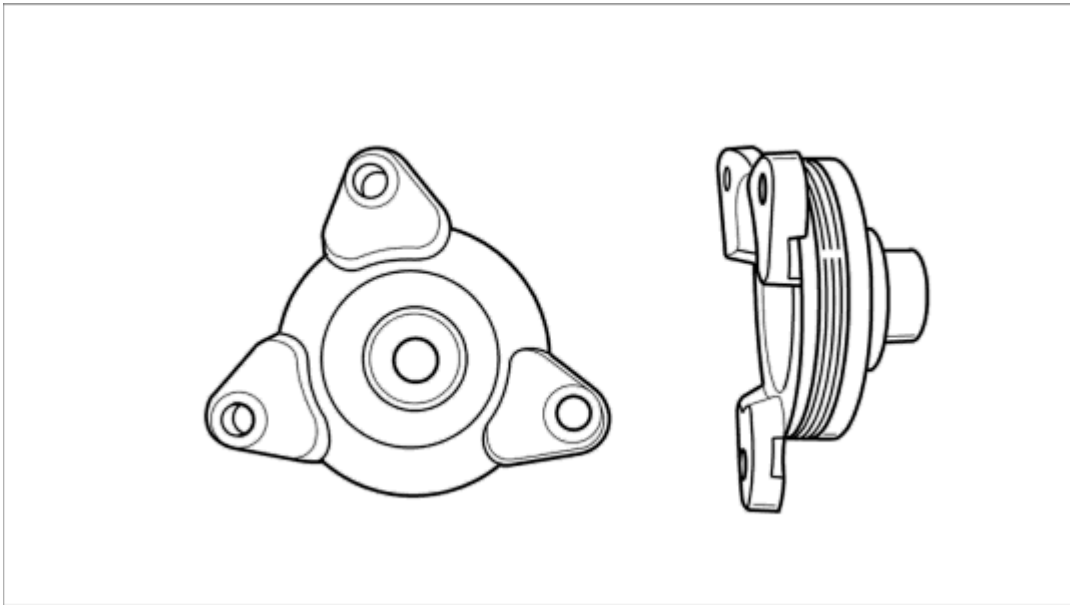


Fig. 93: Bearing cover with sealing ring

Courtesy of PORSCHE OF NORTH AMERICA, INC.

1. Lever out two green closure caps on pulley side of cylinder bank 1 - 3.

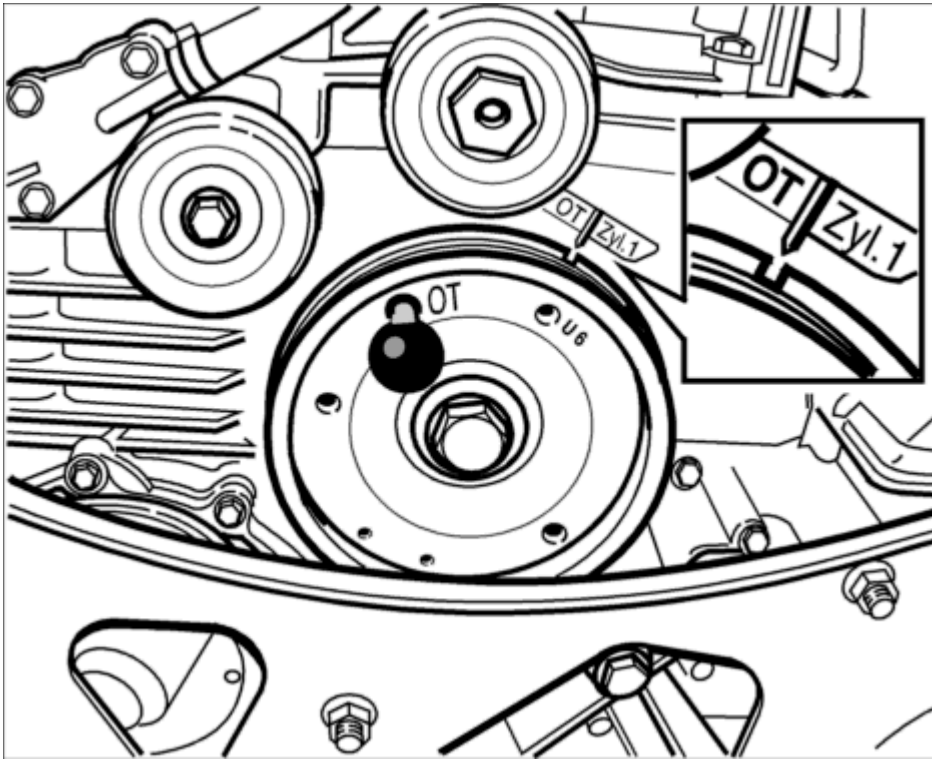


Fig. 94: Fixing pulley

Courtesy of PORSCHE OF NORTH AMERICA, INC.

2. Turn the engine at the hexagon-head bolt (a/f 24) of the crankshaft belt pulley clockwise to overlapping TDC of cylinder bank 1 and fix it with special tool **fixing pins P 9595/1**.

2007 Porsche Boxster

ENGINE Cylinder head, valve drive - Boxster And Cayman

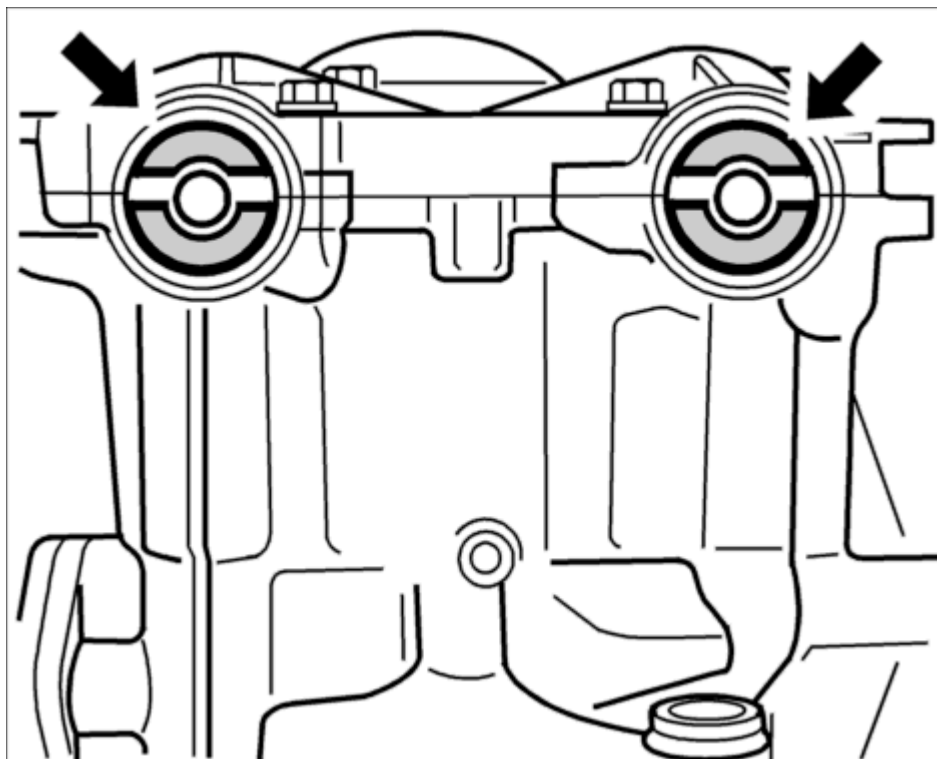


Fig. 95: Cam slot position at overlapping TDC of cylinder 1

Courtesy of PORSCHE OF NORTH AMERICA, INC.

3. To check the camshaft adjustment, insert **adjusting gauge P 9686** for camshaft into the camshaft slots (pulley side) (inscription on gauge and small circular cut-outs point towards cylinder head cover). If the gauge cannot be inserted, rotate the crankshaft a further 360° and secure it again.
4. Unscrew two M6 x 12 hexagon-head bolts on the coolant pipe mount (Tiptronic) at cylinder side 1 - 3.

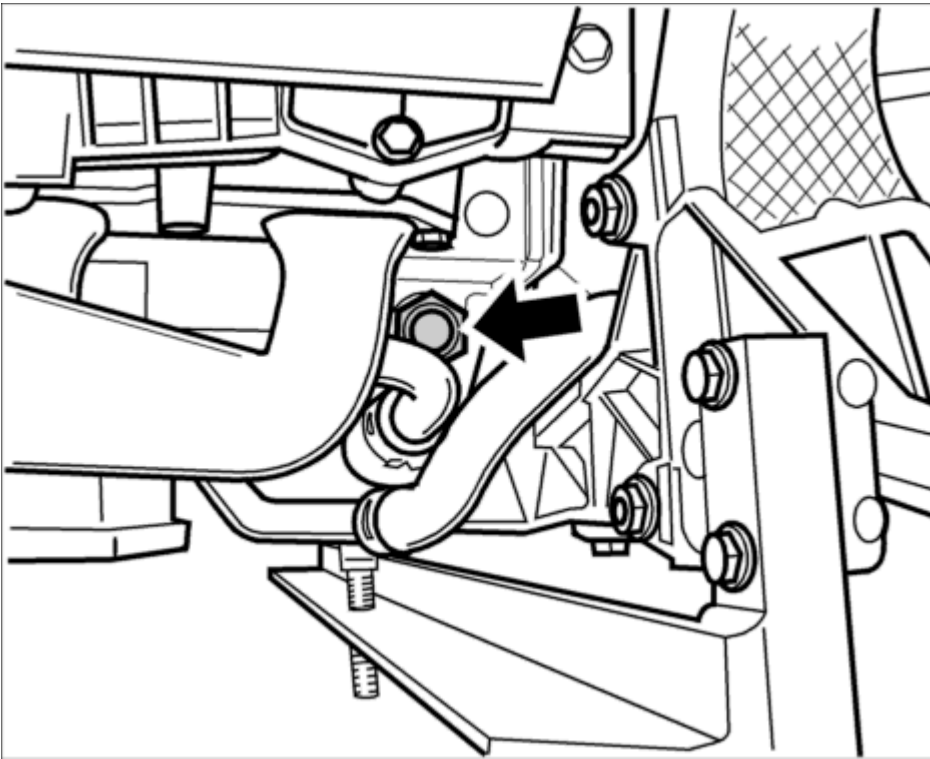


Fig. 96: Primary chain tensioner

Courtesy of PORSCHE OF NORTH AMERICA, INC.

5. Remove primary chain tensioner (hexagon socket a/f 32).

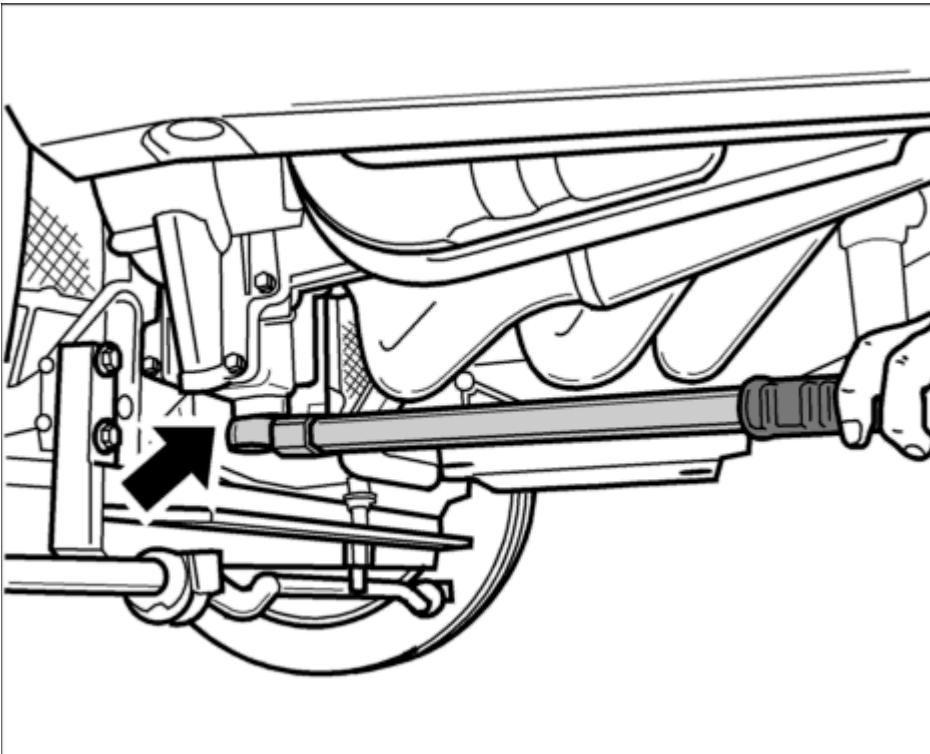
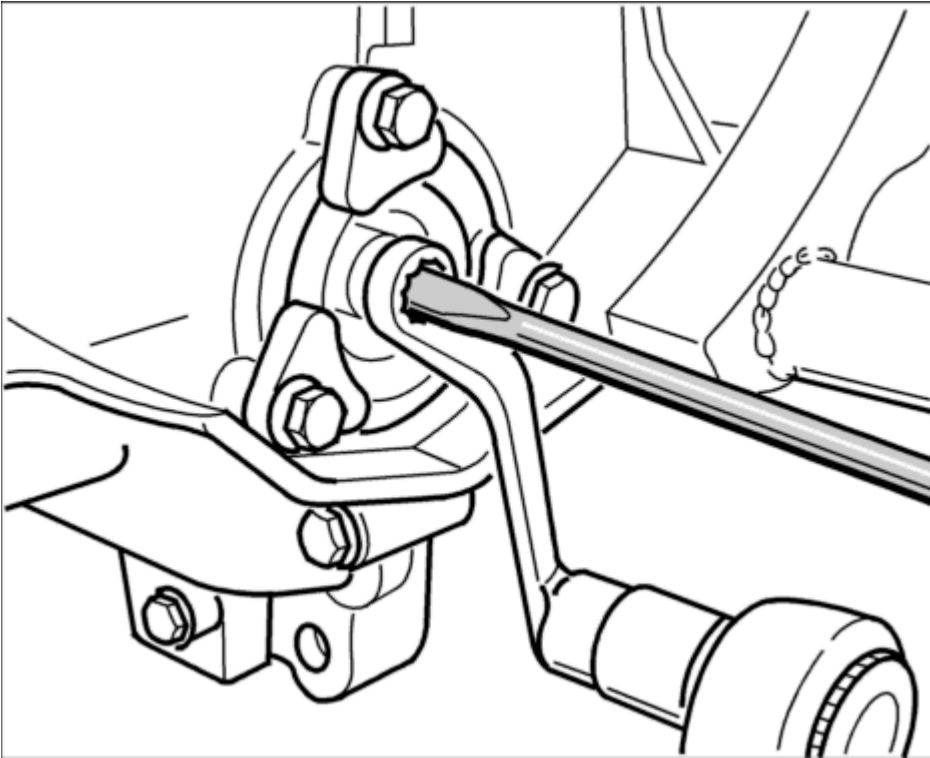


Fig. 97: Chain tensioner, cylinders 1 - 3

Courtesy of PORSCHE OF NORTH AMERICA, INC.

6. Remove chain tensioner, cylinder bank 1 - 3 (hexagon socket a/f 32).

**Fig. 98: Collar nut for bearing cover**

Courtesy of PORSCHE OF NORTH AMERICA, INC.

7. Unscrew M8 hexagon collar nut on the housing of the intermediate shaft with special tool **socket wrench P 9110**, while at the same time countering the slotted threaded pin on the intermediate shaft with a screwdriver.

8. Unscrew the three M6 x 20 hexagon-head bolts (coated) on the intermediate-shaft flange. Replace coated screws during installation and clean threaded bores.

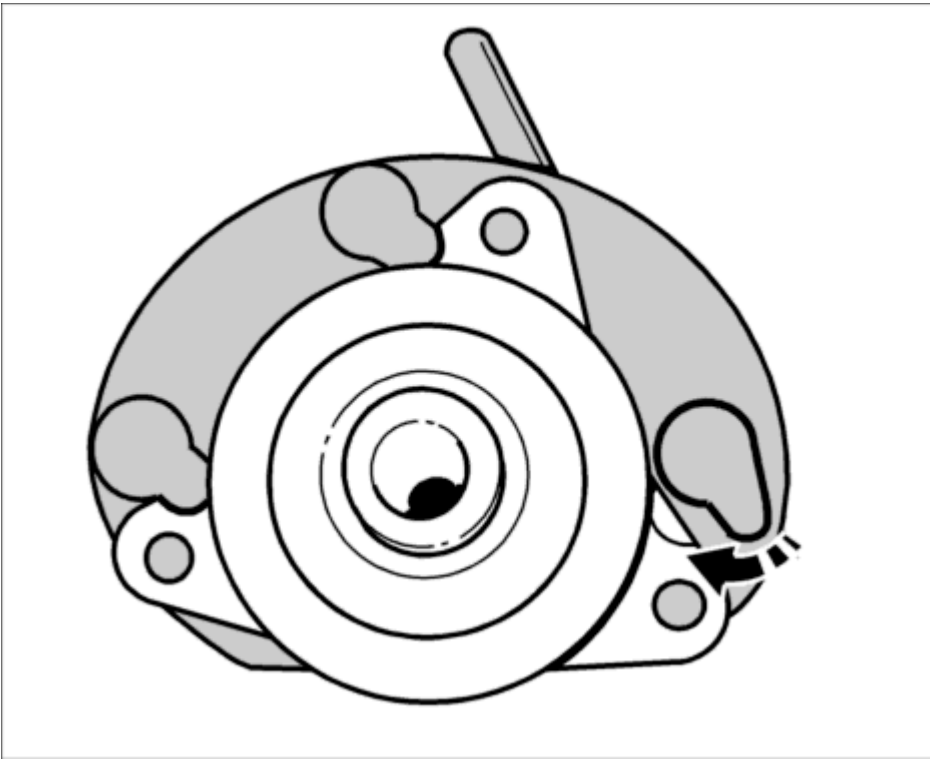


Fig. 99: Puller on bearing cover: View from intermediate shaft
Courtesy of PORSCHE OF NORTH AMERICA, INC.

9. Position special tool **puller P 9673** at the housing grooves and secure by turning the locking lever anti-clockwise.

2007 Porsche Boxster

ENGINE Cylinder head, valve drive - Boxster And Cayman

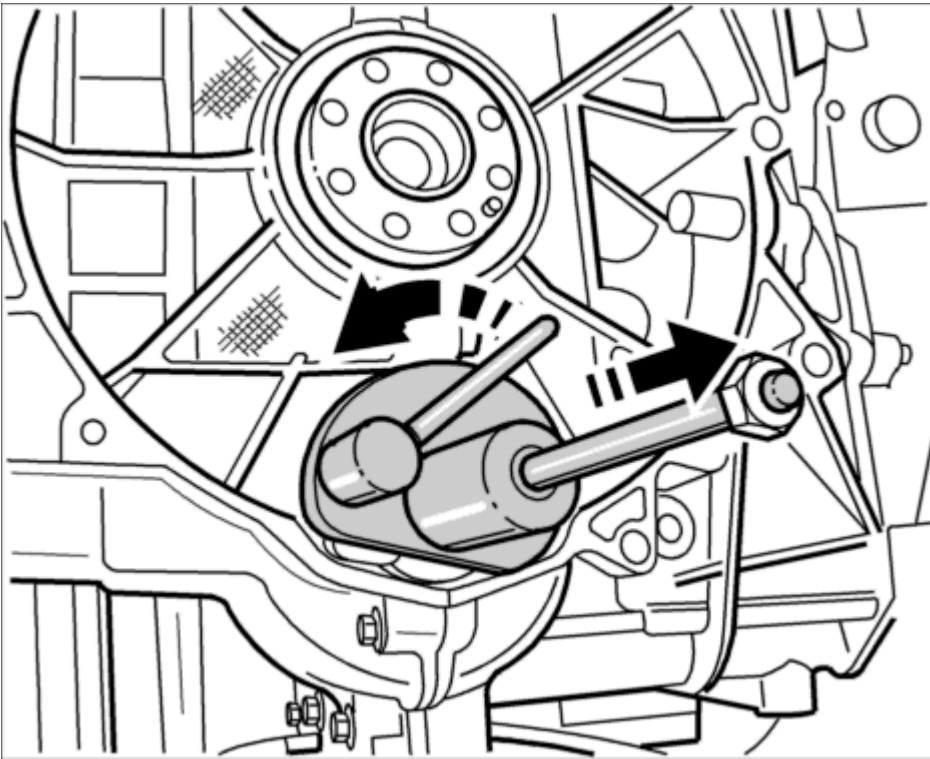


Fig. 100: Removing bearing cover

Courtesy of PORSCHE OF NORTH AMERICA, INC.

10. Pull the slide hammer on the puller a number of times against the stop nuts while countering the tool at the same time with the other hand.

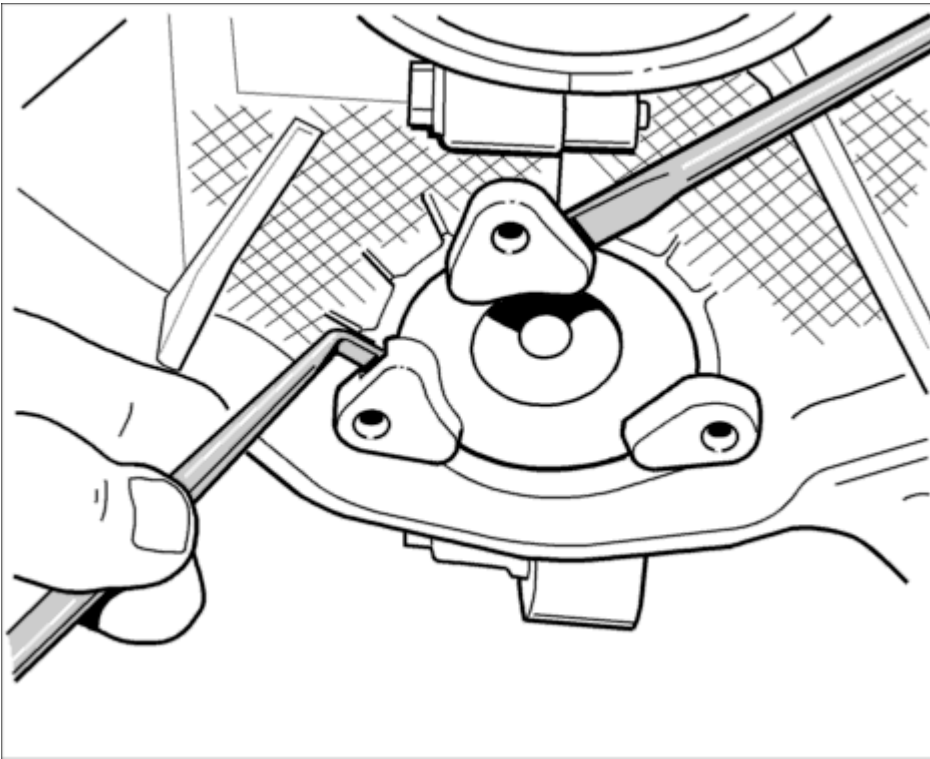


Fig. 101: Levering out bearing cover

Courtesy of PORSCHE OF NORTH AMERICA, INC.

11. If the puller is not available, lever the bearing cover out carefully using two screwdrivers (or angle screwdrivers), for example. Move the bearing cover frequently to the left and right to make the levering easier. Do not damage the sealing surfaces.

INSTALLING BEARING COVER FOR INTERMEDIATE SHAFT

Installing bearing cover for intermediate shaft

NOTE:

- ***Clean working area of bore for bearing cover and crankcase thoroughly using acetone or solvent naphtha.***

NOTE:

- ***Replace bearing cover or sealing ring for bearing cover --> 152355
Replacing sealing ring for intermediate shaft.***

1. Before installing the new bearing cover, check the fitted bore (axial attachment surface, bore chamfers) on the crankcase for sharp edges and burrs. They should be removed with an oilstone or a polishing cloth. Remove any existing residue and clean the bore with a clean cloth soaked in solvent naphtha or acetone.

2. Grease fitted bore in crankcase and new bearing cover (with new sealing ring) with special grease Optimoly MP3 (available from Porsche Parts Service) and place bearing cover in position.

NOTE:

- ***Replace collar nut M8 x 1 and coated M6 screws for bearing cover.***

3. Position three new, coated M6 x 20 screws on the crankcase and pull in the bearing cover by screwing in the screws uniformly. Tighten screws --> **Tightening torque: 7.5 ftlb. .**

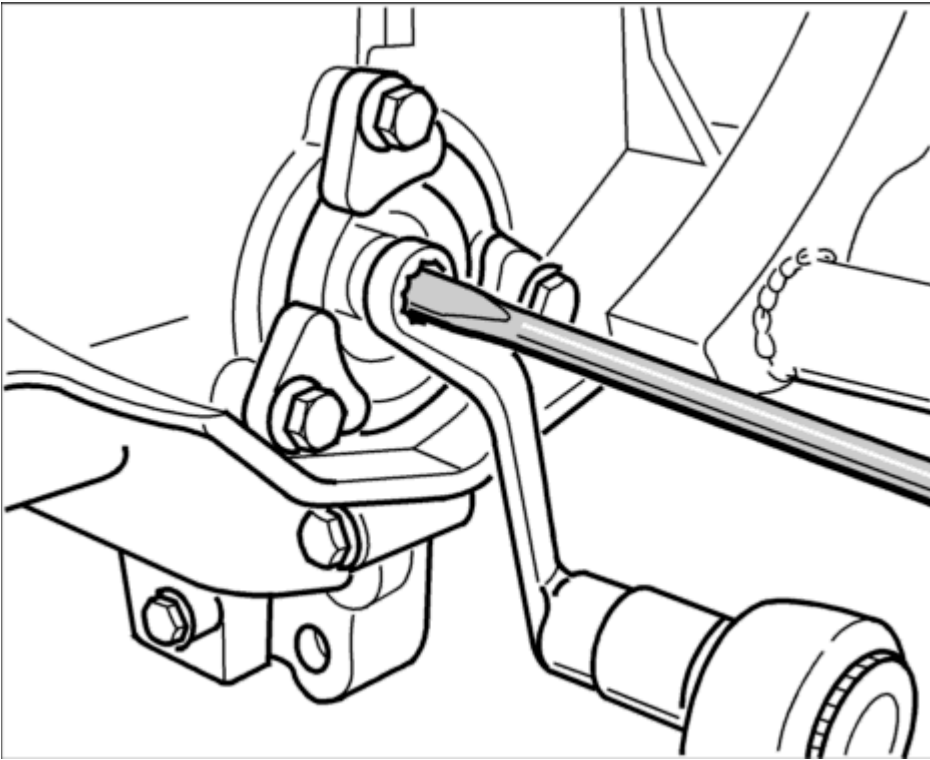


Fig. 102: Collar nut for bearing cover

Courtesy of PORSCHE OF NORTH AMERICA, INC.

4. Position new M8 x 1 collar nut on the threaded pin of the intermediate shaft. Then tighten the nut using special tool **socket wrench P 9110**. At the same time, counter with a screwdriver in the slotted threaded pin of the intermediate shaft. --> **Tightening torque: 9 ftlb. +0.5 ftlb.**

2007 Porsche Boxster

ENGINE Cylinder head, valve drive - Boxster And Cayman

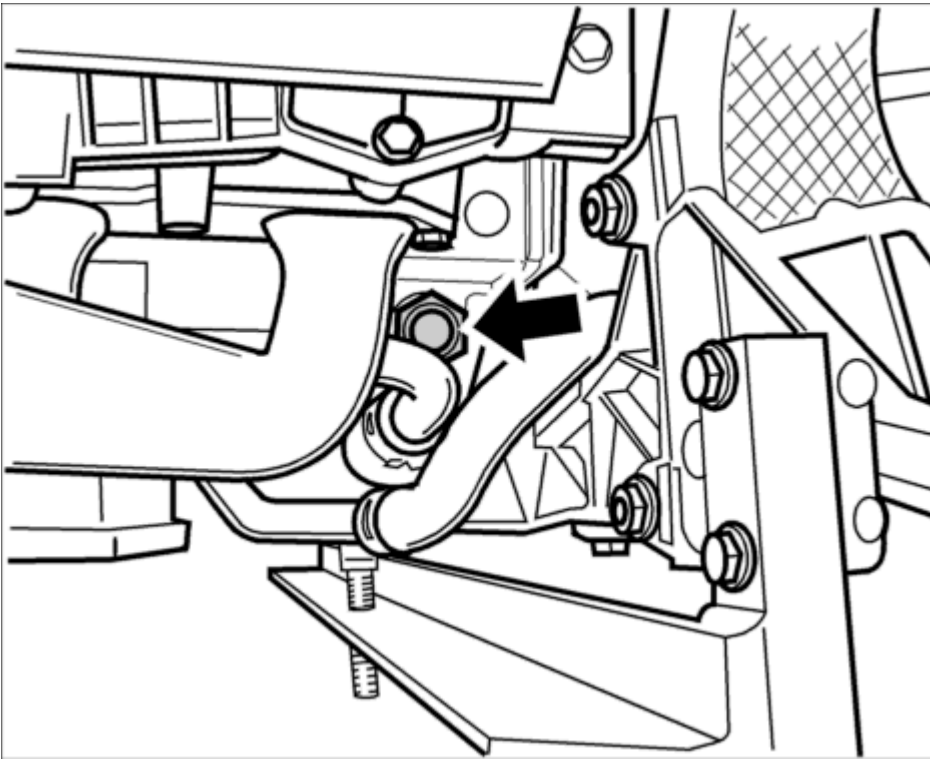


Fig. 103: Primary chain tensioner

Courtesy of PORSCHE OF NORTH AMERICA, INC.

5. Insert primary chain tensioner with new aluminum sealing ring (hexagon a/f 32) and tighten to the specified torque. --> **Tightening torque: 59 ftlb.**

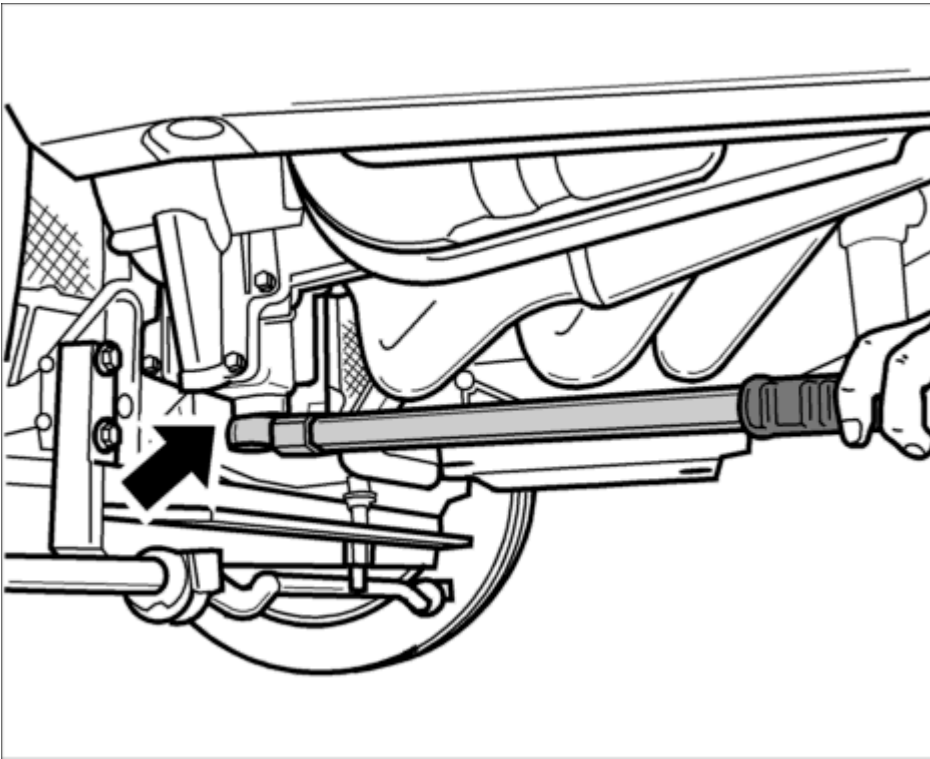


Fig. 104: Chain tensioner, cylinders 1 - 3

Courtesy of PORSCHE OF NORTH AMERICA, INC.

6. Insert chain tensioner for cylinder 1 - 3 with new aluminum sealing ring (hexagon a/f 32) and tighten to the specified torque. --> **Tightening torque: 59 ftlb.**
7. Fasten coolant pipes on cylinder side 1 - 3 with two M6 x 12 hexagon-head bolts. --> **Tightening torque: 7.5 ftlb.**
8. Fit two new closure caps on cylinder head cover.
9. Pull fixing pin out of the crankshaft belt pulley.

SUBSEQUENT WORK FOR BEARING COVER FOR INTERMEDIATE SHAFT

Subsequent work for bearing cover for intermediate shaft

Tiptronic:

1. Install drive plate for converter. Refer to **13 63 19 Removing and installing drive plate for converter - as of MY 2005 (All Models)** .
2. Install automatic transmission. Refer to **37 35 19 Removing and installing automatic transmission - as of MY 2005 (Boxster S, Boxster S RHD)** . Refer to **37 35 19 Removing and installing automatic transmission - as of MY 2005 (Boxster, Boxster RHD)** .

2007 Porsche Boxster

ENGINE Cylinder head, valve drive - Boxster And Cayman

Manual transmission:

3. Install clutch. Refer to **30 50 19 Removing and installing clutch - as of MY 2005 (All Models)** .
4. Install double-mass flywheel. Refer to **13 60 19 Removing and installing flywheel - as of MY 2005 (All Models)** .
5. Install transmission. Refer to **34 35 19 Removing and installing transmission - as of MY 2005 (All Models)** .

All:

6. Filling in engine oil. Refer to **17 01 55 Engine oil and oil filter change - as of MY 2005 (All Models)** .

NOTE:

- *Note the work instructions for disconnecting and reconnecting the battery.*

7. Connect the battery --> **27 06 IN WORK INSTRUCTIONS AFTER DISCONNECTING THE BATTERY - AS OF MY 2005 (ALL MODELS)** .

15 21 19 REMOVING AND INSTALLING BEARING COVER FOR INTERMEDIATE SHAFT - M96/25 - AS OF MY 2005 (BOXSTER, BOXSTER RHD)

TOOLS

Designation	Type	Number	Explanation	
cover for dust protection when fitting the engine	special tool	NR.165		
socket wrench	special tool	P 9110		
locating pins	special tool	P 9595/1		
puller	special tool	P 9673		
assembly tool	special tool	P 9673/1		
adjusting gauge	special tool	P 9686		

PRELIMINARY WORK FOR BEARING COVER FOR INTERMEDIATE SHAFT

Preliminary work for bearing cover for intermediate shaft

NOTE:

- *Note the work instructions for disconnecting and reconnecting the battery.*

1. Disconnect the battery --> **27 06 IN WORK INSTRUCTIONS AFTER DISCONNECTING THE BATTERY - AS OF MY 2005 (ALL MODELS)** .
2. Drain engine oil. Refer to **17 01 55 Engine oil and oil filter change - as of MY 2005 (All Models)** .

2007 Porsche Boxster

ENGINE Cylinder head, valve drive - Boxster And Cayman

Tiptronic:

3. Remove automatic transmission. Refer to **37 35 19 Removing and installing automatic transmission - as of MY 2005 (Boxster, Boxster RHD)** .

4. Remove drive plate for converter. Refer to **13 63 19 Removing and installing drive plate for converter - as of MY 2005 (All Models)** .

Manual transmission:

5. Remove manual transmission. Refer to **34 35 19 Removing and installing transmission - as of MY 2005 (All Models)** .

6. Remove clutch. Refer to **30 50 19 Removing and installing clutch - as of MY 2005 (All Models)** .

7. Remove double-mass flywheel. Refer to **13 60 19 Removing and installing flywheel - as of MY 2005 (All Models)** .

REMOVING BEARING COVER FOR INTERMEDIATE SHAFT

Removing bearing cover for intermediate shaft - up to engine number 61.504715

CAUTION: Timing chain may jump over.

- Risk of engine damage

--> Following removal of the chain tensioner, the crankshaft must not be turned under any circumstances.

CAUTION: Risk of damage due to particles of dirt.

- Oil bores/oil ducts can become blocked up.

--> When working on the engine, absolute cleanliness is essential.

--> Lay removed engine parts on a clean base and cover them without fail.

--> Use the **cover for dust protection when fitting the engine NR.165** on the engine assembly support.

NOTE: Always observe specified engine number range.

Bearing covers

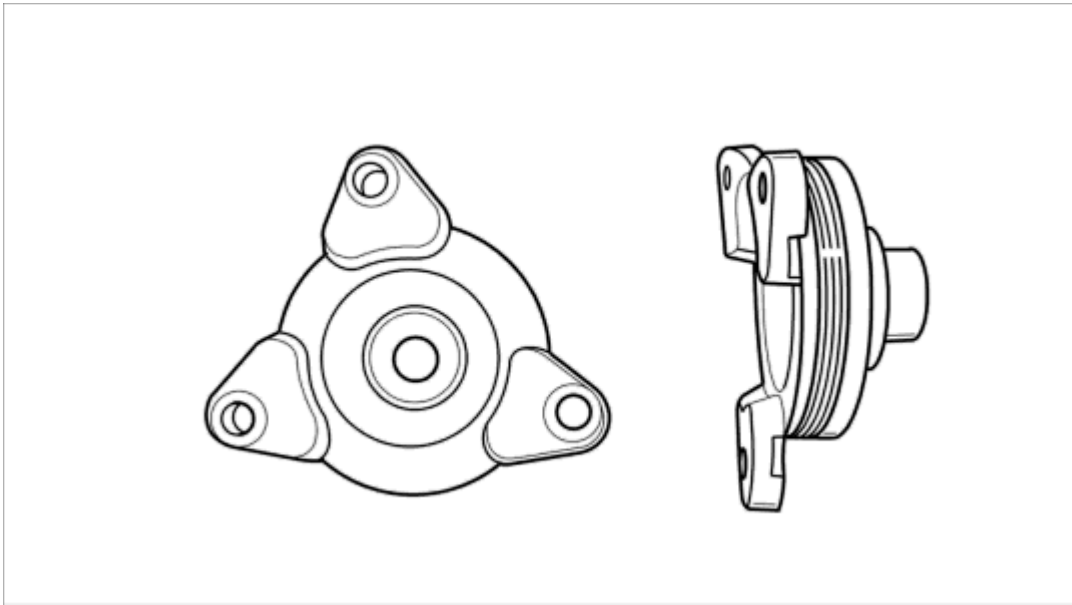


Fig. 105: Bearing cover with sealing ring
Courtesy of PORSCHE OF NORTH AMERICA, INC.

1. Lever out two green closure caps on pulley side of cylinder bank 1 - 3.

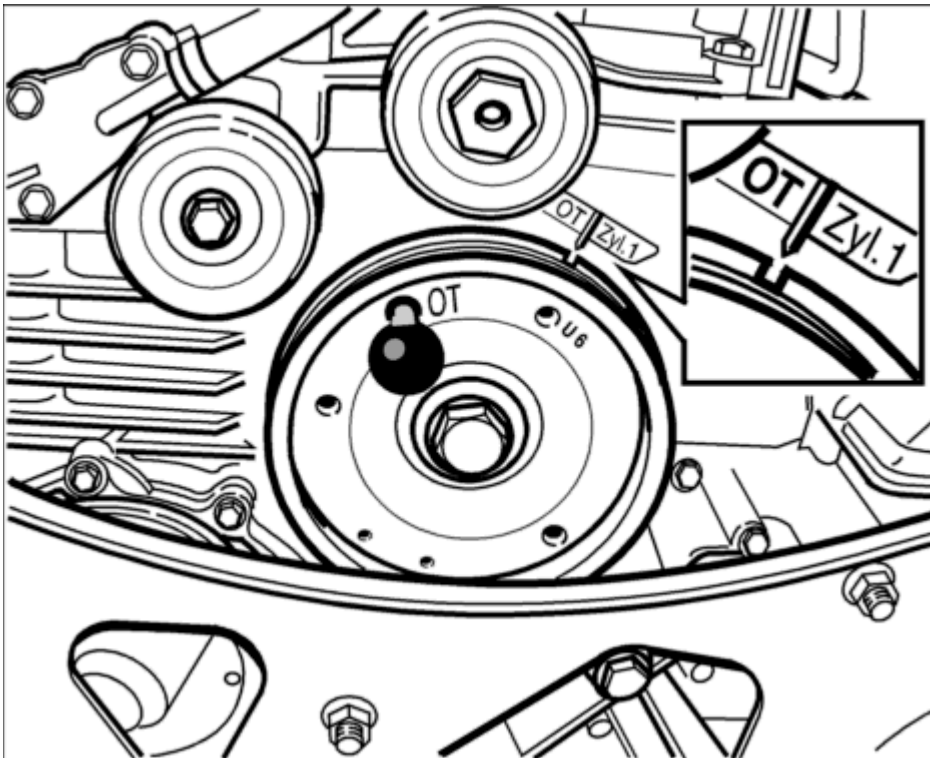


Fig. 106: Fixing pulley
Courtesy of PORSCHE OF NORTH AMERICA, INC.

2. Turn the engine at the hexagon-head bolt (a/f 24) of the crankshaft belt pulley clockwise to overlapping TDC

of cylinder bank 1 and fix it with special tool **locating pins P 9595/1**.

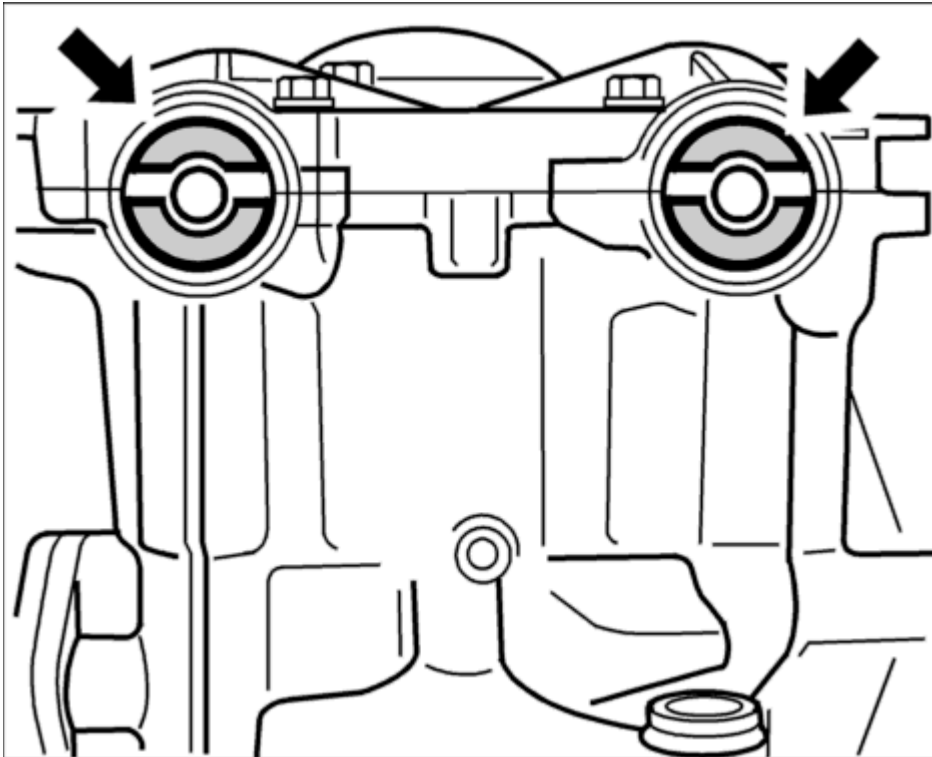


Fig. 107: Cam slot position at overlapping TDC of cylinder 1
Courtesy of PORSCHE OF NORTH AMERICA, INC.

NOTE:

- ***For checking with the adjusting gauge, the timing adjustment must be correct.***

3. To check the camshaft adjustment, insert **adjusting gauge P 9686** for camshaft into the camshaft slots (pulley side) (inscription on gauge and small circular cut-outs point towards cylinder head cover). If the gauge cannot be inserted, rotate the crankshaft a further 360° and secure it again.

4. Unscrew two M6 x 12 hexagon-head bolts on the coolant pipe mount (Tiptronic) at cylinder side 1 - 3.

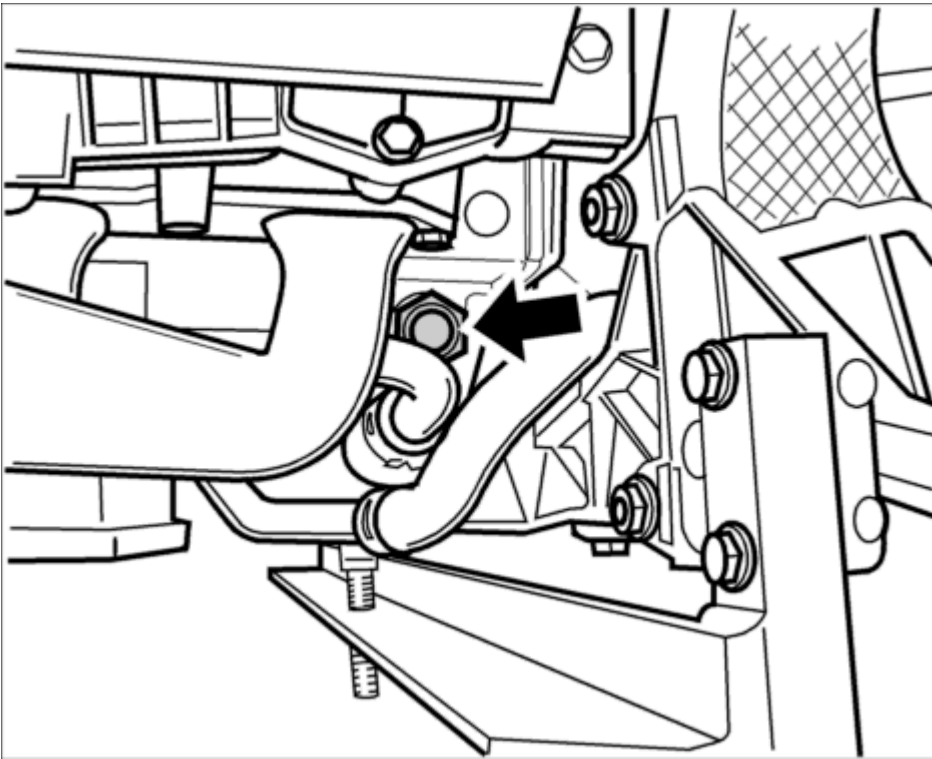


Fig. 108: Primary chain tensioner

Courtesy of PORSCHE OF NORTH AMERICA, INC.

5. Remove primary chain tensioner (hexagon socket a/f 32).

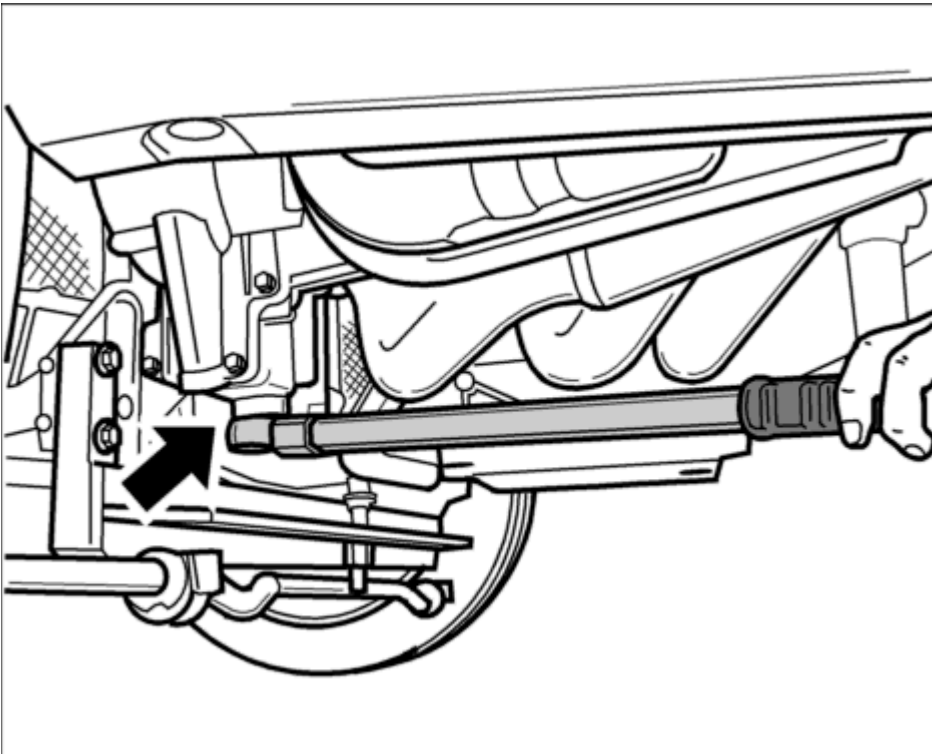
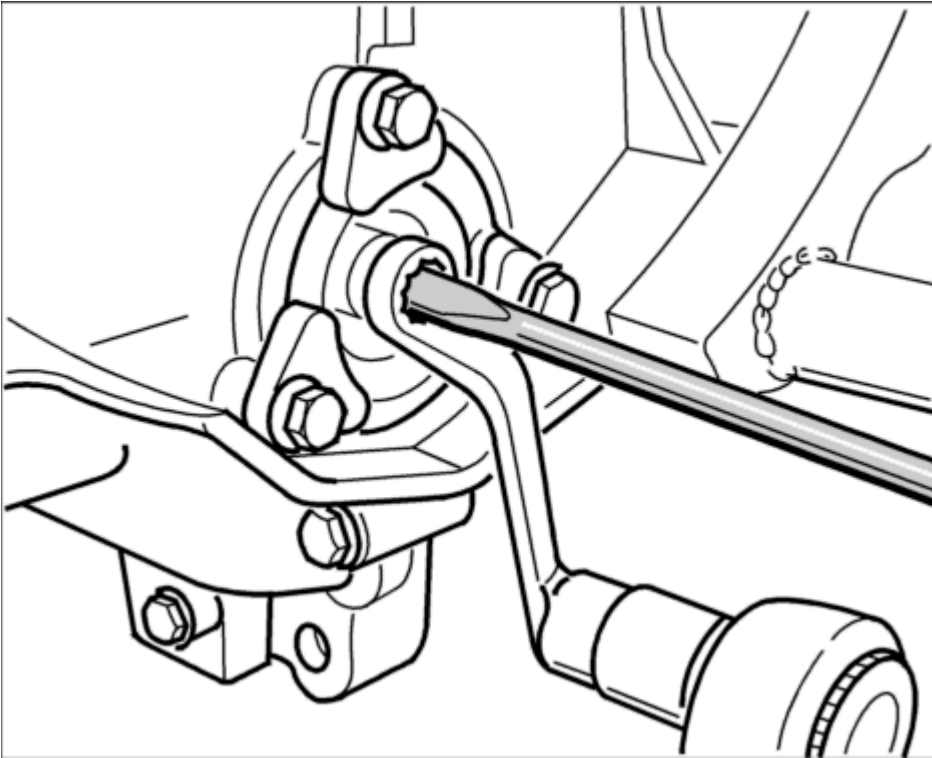


Fig. 109: Chain tensioner, cylinders 1 - 3

Courtesy of PORSCHE OF NORTH AMERICA, INC.

6. Remove chain tensioner, cylinder bank 1 - 3 (hexagon socket a/f 32).

**Fig. 110: Collar nut for bearing cover**

Courtesy of PORSCHE OF NORTH AMERICA, INC.

NOTE:

- *To make it easier to remove the bearing cover, spray the sealing surface with anti-rust agent.*

7. Unscrew M8 hexagon collar nut on the bearing cover of the intermediate shaft with special tool **socket wrench P 9110**, while at the same time countering at the slotted threaded pin on the intermediate shaft with a screwdriver.

8. Unscrew the three M6 x 20 hexagon-head bolts (coated) on the intermediate-shaft flange. Replace coated screws during installation and clean threaded bores.

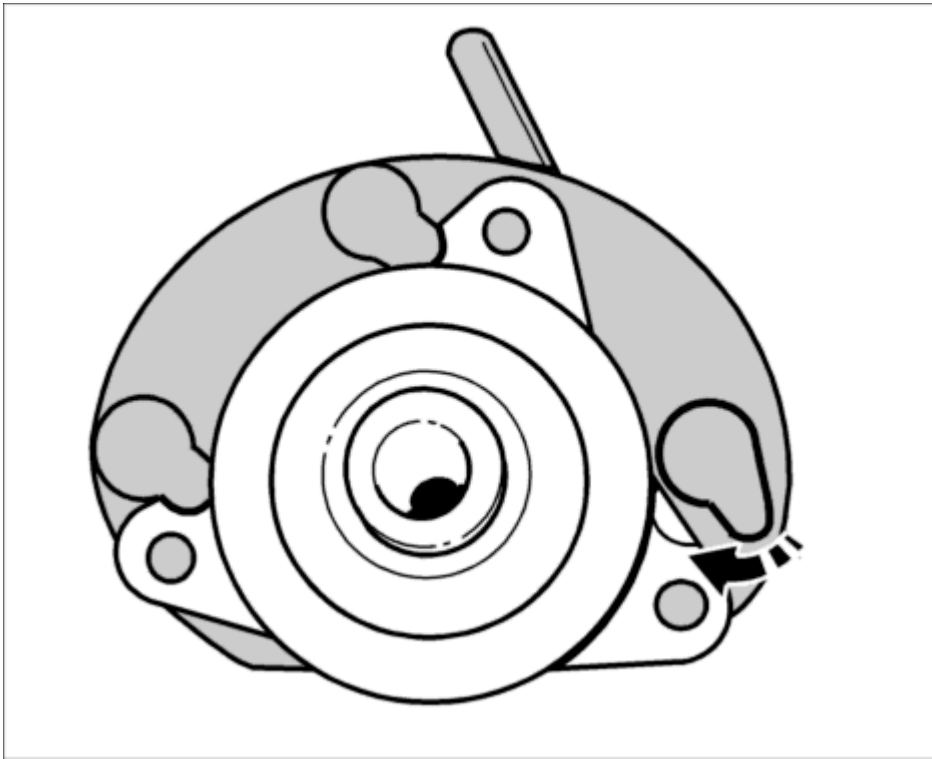


Fig. 111: Puller on bearing cover: view when removed

Courtesy of PORSCHE OF NORTH AMERICA, INC.

NOTE:

- *Remove bearing cover using special tool*
- *After removing the bearing cover, do not press the threaded bolts of the intermediate shaft.*

puller P 9673. If this is not available, lever the bearing cover out carefully with two screwdrivers so as not to damage the sealing surfaces. Turning several times to the left and right loosens the bearing cover.

9. Position special tool **puller P 9673** at the bearing cover grooves and secure by turning the locking lever anti-clockwise.

2007 Porsche Boxster

ENGINE Cylinder head, valve drive - Boxster And Cayman

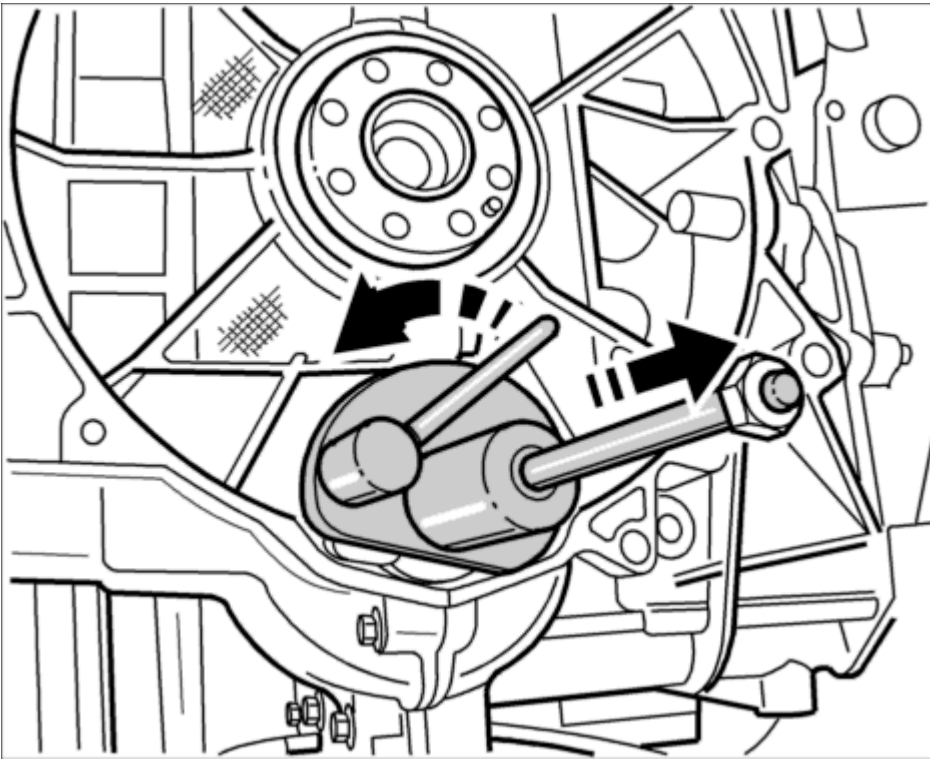


Fig. 112: Removing bearing cover

Courtesy of PORSCHE OF NORTH AMERICA, INC.

10. Pull the slide hammer on the puller a number of times against the stop nuts while countering the tool at the same time with the other hand.

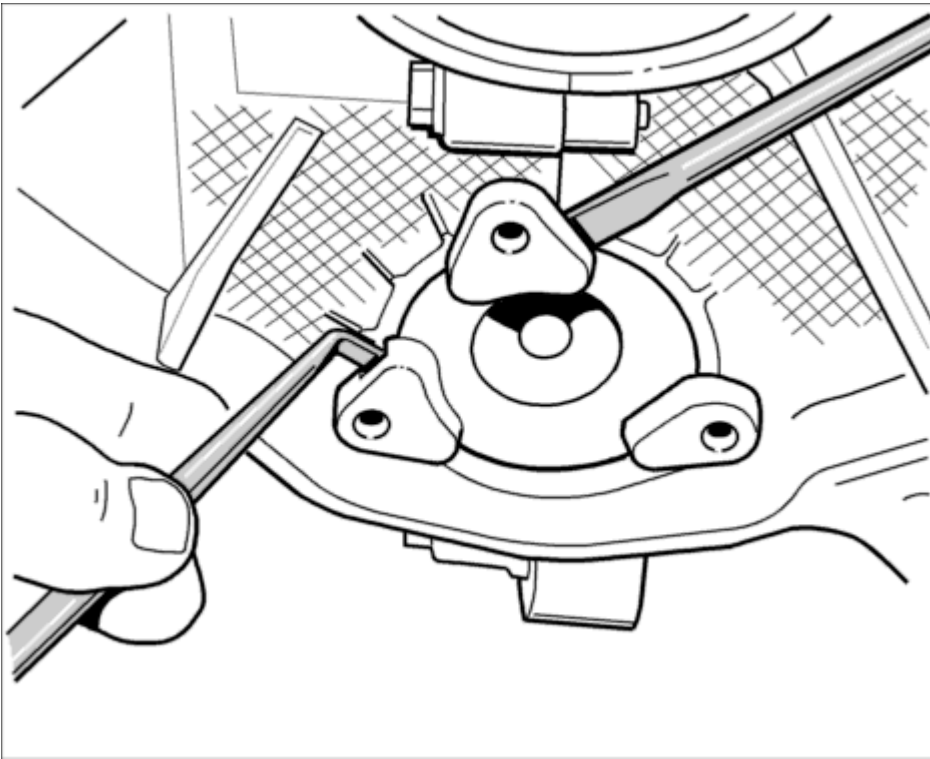


Fig. 113: Levering out bearing cover

Courtesy of PORSCHE OF NORTH AMERICA, INC.

11. If the puller is not available, lever the bearing cover out carefully using two screwdrivers (or angle screwdrivers), for example. Move the bearing cover frequently to the left and right to make the levering easier. Do not damage the sealing surfaces.

Removing bearing cover for intermediate shaft - from engine number 61.504716

CAUTION: Timing chain may jump over.

- Risk of engine damage

--> Following removal of the chain tensioner, the crankshaft must not be turned under any circumstances.

CAUTION: Risk of damage due to particles of dirt.

- Oil bores/oil ducts can become blocked up.

--> When working on the engine, absolute cleanliness is essential.

--> Lay removed engine parts on a clean base and cover them without fail.

--> Use the **cover for dust protection when fitting the engine NR.165** on the engine assembly support.

NOTE:

- *The same sealing ring and installation/removal procedure applies as for the "old" bearing cover.*
- *The new bearing cover can only be retrofitted along with the new intermediate shaft up to model year 2003.*

NOTE:

Always observe specified engine number range.

Overview of bearing covers for intermediate shaft.

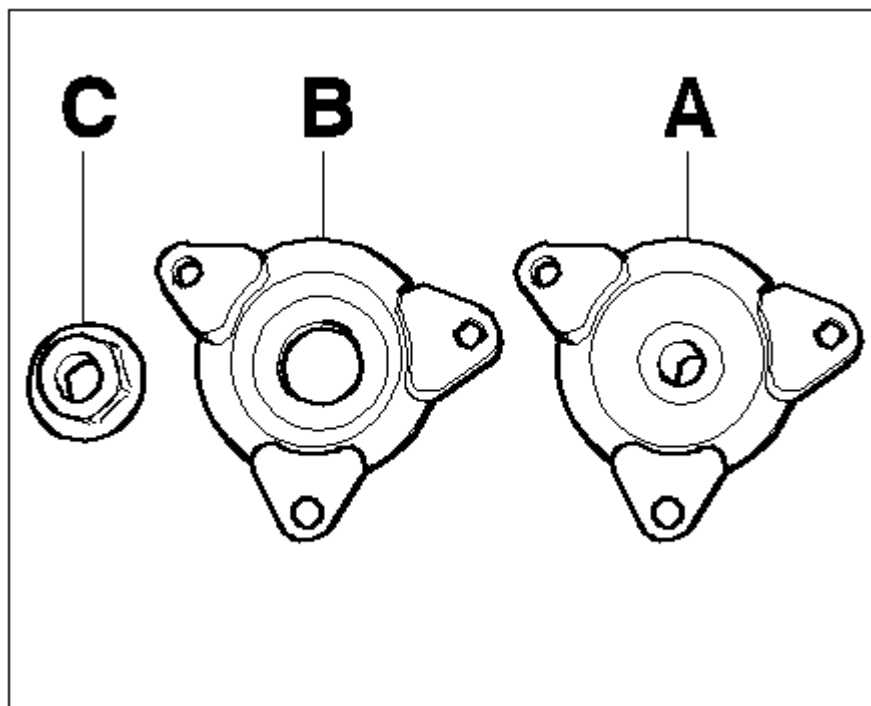


Fig. 114: Differentiation of bearing covers for intermediate shaft
Courtesy of PORSCHE OF NORTH AMERICA, INC.

- A - Bearing cover 996.105.024.01
- B - Bearing cover 996.105.024.06
- C - Collar nut, M12 x 1.25

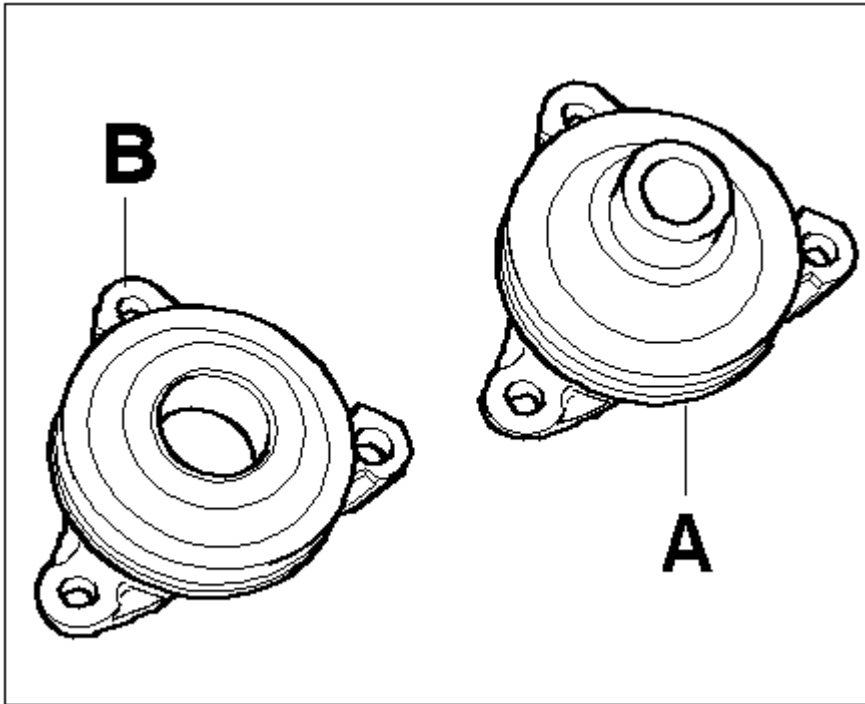


Fig. 115: Rear view of bearing cover for intermediate shaft
Courtesy of PORSCHE OF NORTH AMERICA, INC.

Rear of bearing cover

- A - Rear of bearing cover 996.105.024.01
- B - Rear of bearing cover 996.105.024.06

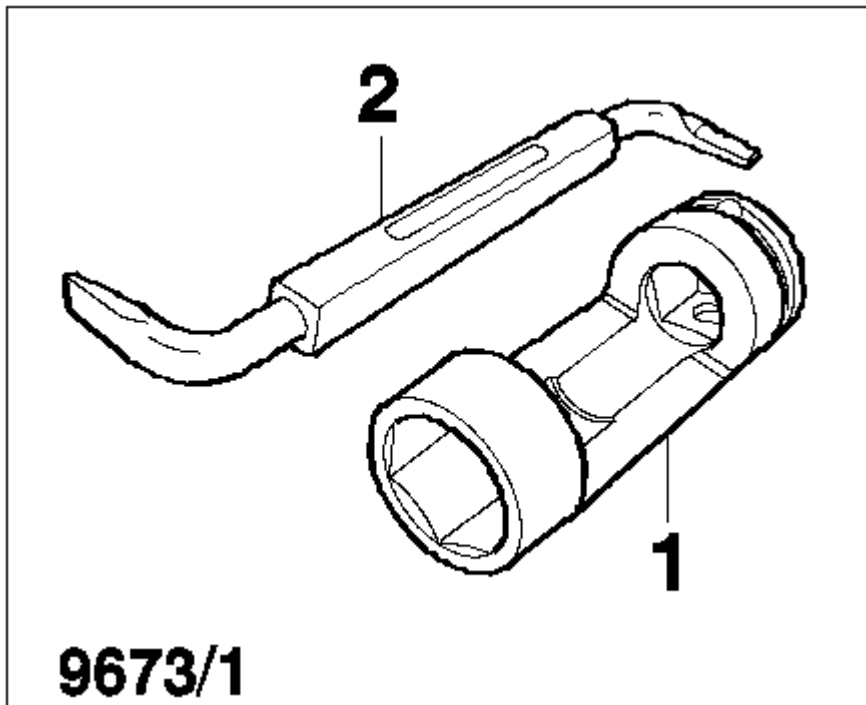


Fig. 116: Special tool 9673/1

Courtesy of PORSCHE OF NORTH AMERICA, INC.

Use the special tool assembly tool P 9673/1 for the M12 collar nut threaded joint.

1. Lever out two green closure caps on pulley side of cylinder bank 1 - 3.

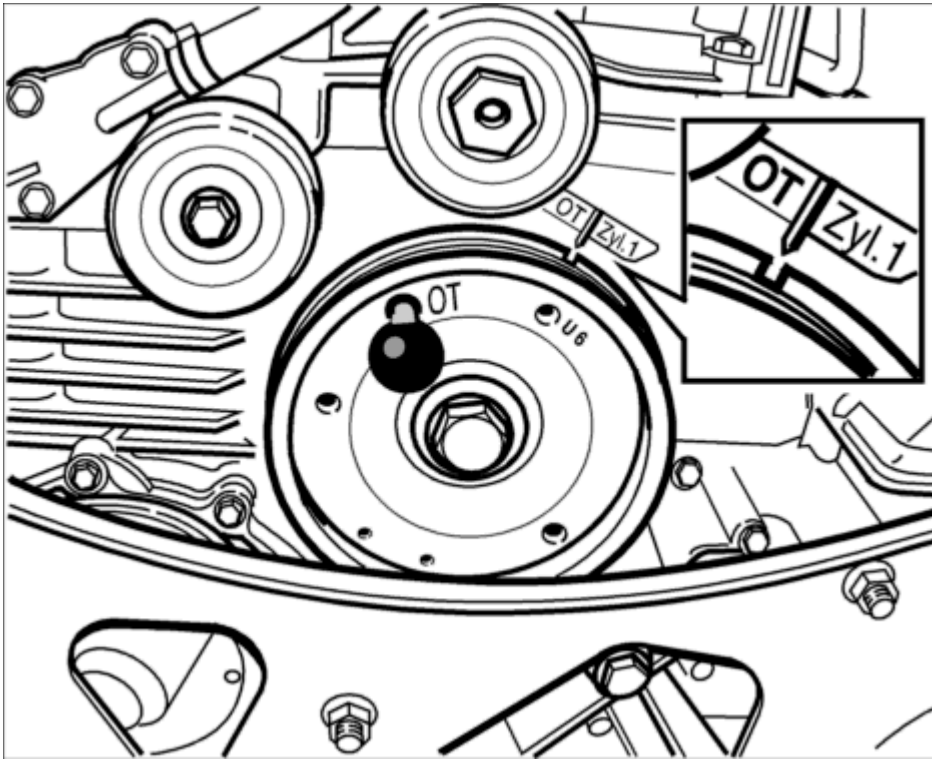


Fig. 117: Fixing pulley

Courtesy of PORSCHE OF NORTH AMERICA, INC.

2. Turn the engine at the hexagon-head bolt (a/f 24) of the crankshaft belt pulley clockwise to overlapping TDC of cylinder bank 1 - 3 and fix it with special tool locating pins P 9595/1.

NOTE:

- *For checking with the adjusting gauge, the timing adjustment must be correct.*

3. To check the camshaft adjustment, insert adjusting gauge P 9686 for camshaft into the camshaft slots (pulley side) (inscription on gauge pointing towards cylinder head cover). If the gauge cannot be inserted, rotate the crankshaft a further 360° and secure it again.

4. Unscrew two M6 x 12 hexagon-head bolts on the coolant pipe at cylinder side 1 - 3 (Tiptronic).

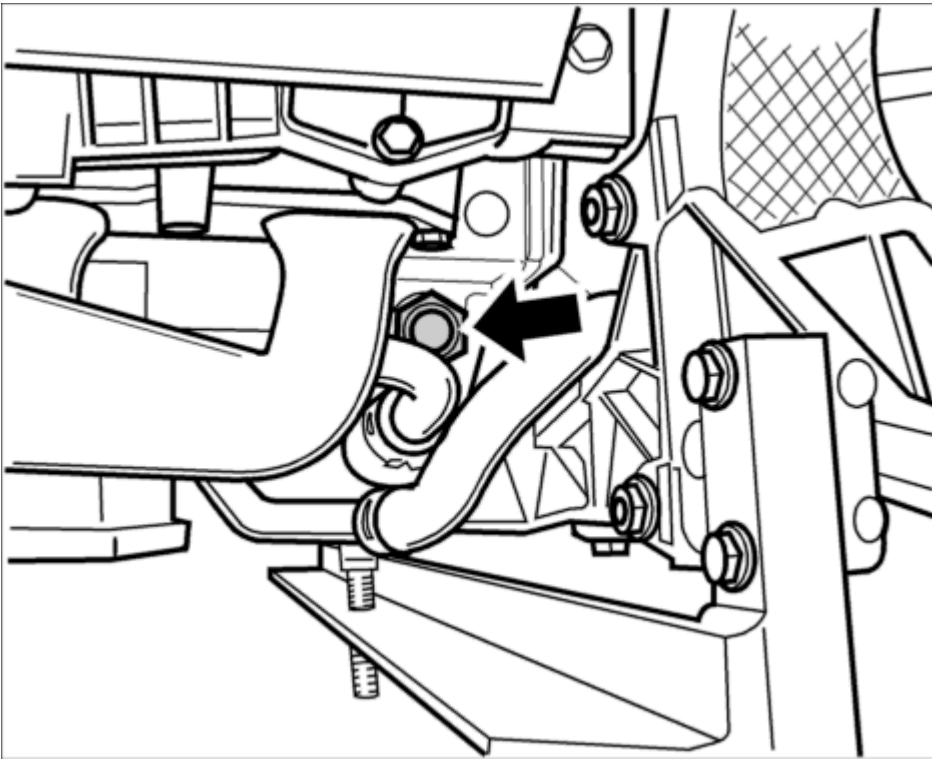


Fig. 118: Primary chain tensioner

Courtesy of PORSCHE OF NORTH AMERICA, INC.

5. Remove primary chain tensioner (hexagon socket a/f 32).

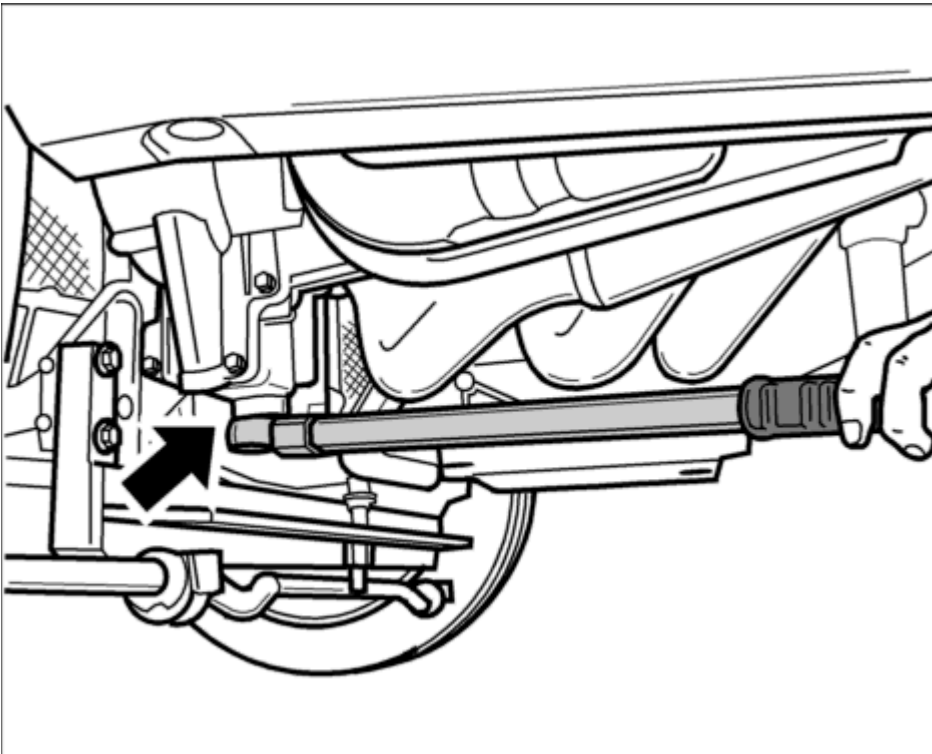


Fig. 119: Chain tensioner, cylinders 1 - 3

Courtesy of PORSCHE OF NORTH AMERICA, INC.

6. Remove chain tensioner, cylinder bank 1 - 3 (hexagon socket a/f 32).

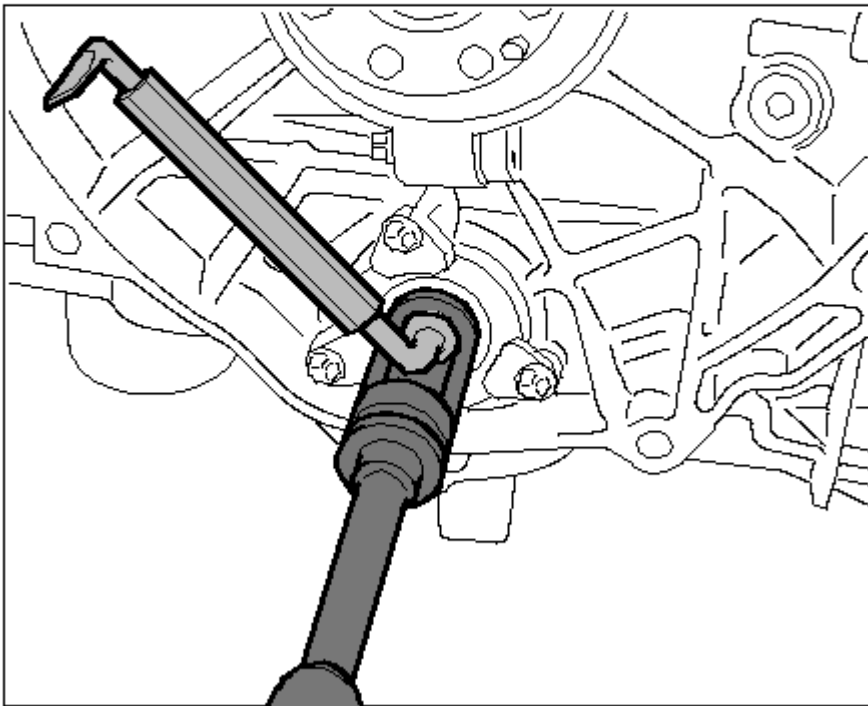


Fig. 120: Threaded joint with collar nut on bearing cover for intermediate shaft

Courtesy of PORSCHE OF NORTH AMERICA, INC.

NOTE:

- *To make it easier to remove the bearing cover, spray the sealing surface with anti-rust agent.*

7. Loosen M12 hexagon collar nut (a/f 22) on bearing cover for intermediate shaft with special tool **assembly tool P 9673/1** and screw it off --> *Threaded joint with collar nut on bearing cover for intermediate shaft* . See **Fig. 120**.

8. Unscrew the three M6 x 20 fastening screws (coated) on the intermediate-shaft flange. Replace screws during installation and clean thread in crankcase.

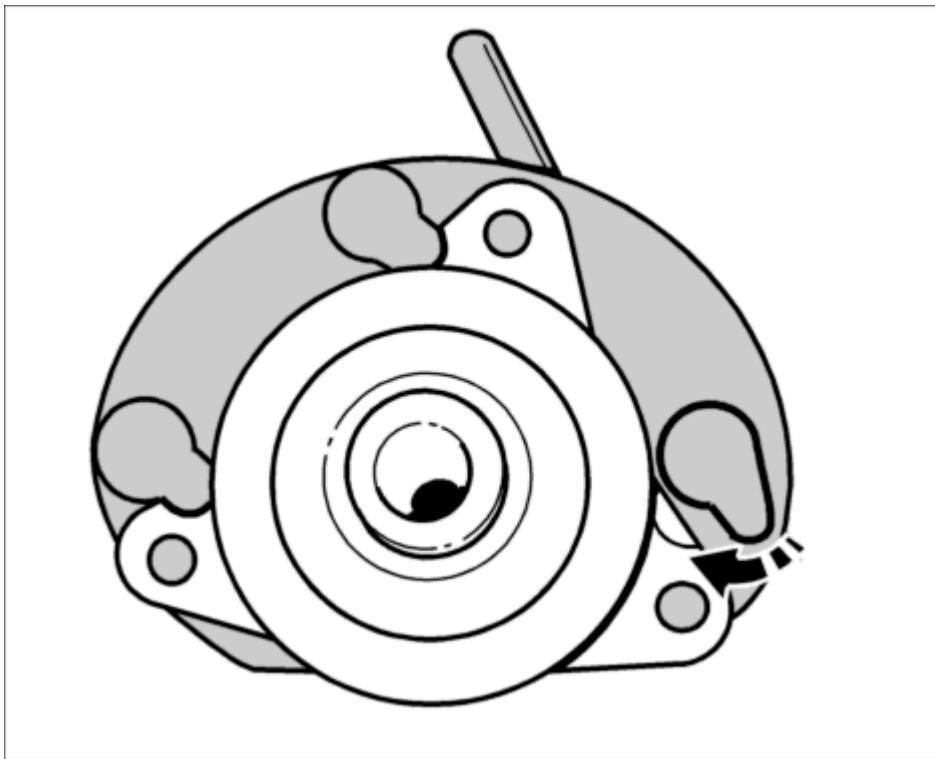


Fig. 121: Puller on bearing cover: view when removed

Courtesy of PORSCHE OF NORTH AMERICA, INC.

NOTE:

- *Remove bearing cover using special tool*
- *After removing the bearing cover, do not press the threaded bolts of the intermediate shaft.*

puller P 9673. If this is not available, lever the bearing cover out carefully with two screwdrivers so as not to damage the sealing surfaces. Turning several times to the left and right loosens the bearing cover.

9. Position special tool **puller P 9673** at the bearing cover grooves and secure by turning the locking lever anti-clockwise.

2007 Porsche Boxster

ENGINE Cylinder head, valve drive - Boxster And Cayman

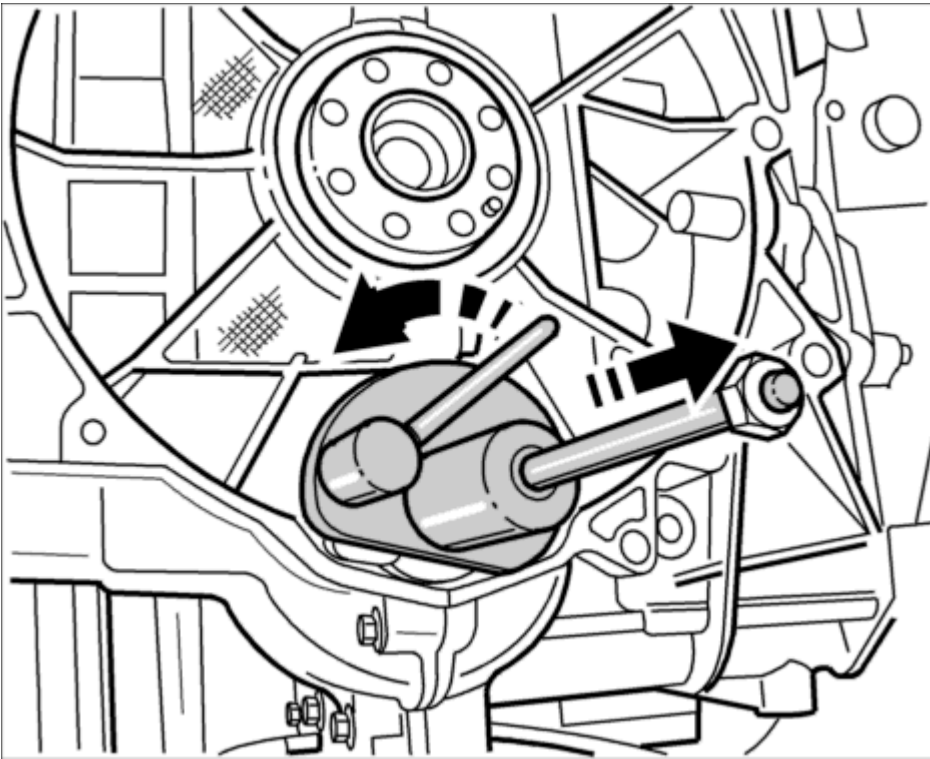


Fig. 122: Removing bearing cover

Courtesy of PORSCHE OF NORTH AMERICA, INC.

10. Pull the slide hammer on the puller a number of times against the stop nuts while countering the tool at the same time with the other hand.

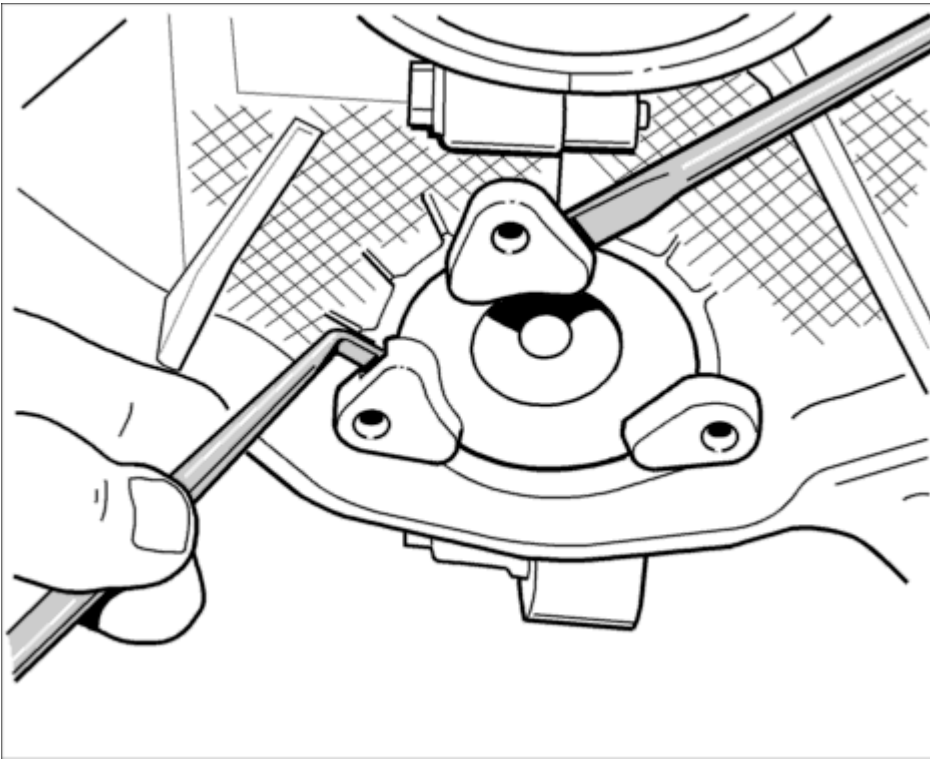


Fig. 123: Levering out bearing cover

Courtesy of PORSCHE OF NORTH AMERICA, INC.

11. If the puller is not available, lever the bearing cover out carefully using two screwdrivers (or angle screwdrivers). Move the bearing cover a number of times to the left and right to make levering easier. Do not damage the sealing surfaces.

INSTALLING BEARING COVER FOR INTERMEDIATE SHAFT

Installing bearing cover for intermediate shaft - up to engine number 61.504715

CAUTION: Risk of damage due to particles of dirt.

- Oil bores/oil ducts can become blocked up.

--> When working on the engine, absolute cleanliness is essential.

--> Lay removed engine parts on a clean base and cover them without fail.

--> Use the cover for dust protection when fitting the engine NR.165 on the engine assembly support.

NOTE:

- *Clean working area of bore for bearing cover and crankcase thoroughly using acetone or solvent naphtha.*

1. Before installing the new bearing cover, check the fitted bore (axial attachment surface, bore chamfers) on

the crankcase for sharp edges and burrs. They should be removed with an oilstone or a polishing cloth. Remove any existing residue and clean the bore with a clean cloth soaked in solvent naphtha or acetone.

NOTE:

- ***Replace bearing cover or sealing ring for bearing cover --> 152355***
Replacing sealing ring for intermediate shaft.

NOTE: Always observe specified engine number range.

2. Grease fitted bore in crankcase and new bearing cover (with new sealing ring) with special grease Optimoly MP3 (available from Porsche Parts Service) and place bearing cover in position.

NOTE:

- ***Replace collar nut M8 x 1 and coated M6 screws for bearing cover.***

3. Position three new, coated M6 x 20 screws on the crankcase and pull in the bearing cover by screwing in the screws uniformly. Tighten the screws. --> **Tightening torque: 10 (7.5 ftlb.) Nm**

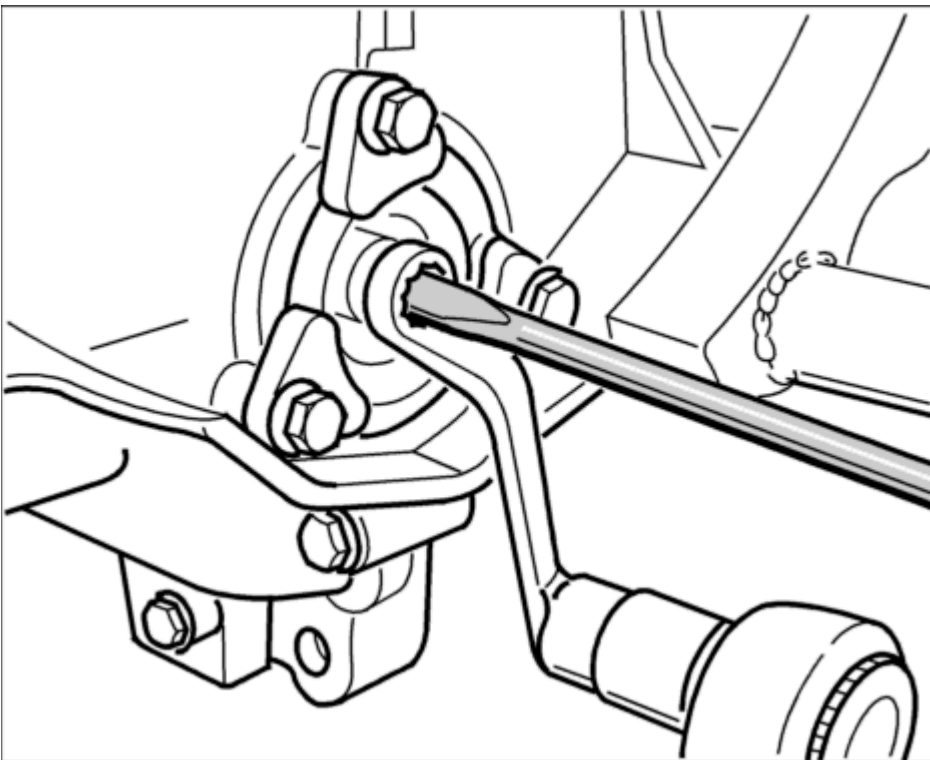


Fig. 124: Collar nut for bearing cover

Courtesy of PORSCHE OF NORTH AMERICA, INC.

4. Position new M8 x 1 collar nut on the threaded pin of the intermediate shaft. Then tighten the nut using special tool **socket wrench P 9110**. At the same time, counter with a screwdriver in the slotted threaded pin of the intermediate shaft. --> **Tightening torque: 12 (9 ftlb.) Nm +1 (0.5 ftlb.) Nm**

2007 Porsche Boxster

ENGINE Cylinder head, valve drive - Boxster And Cayman

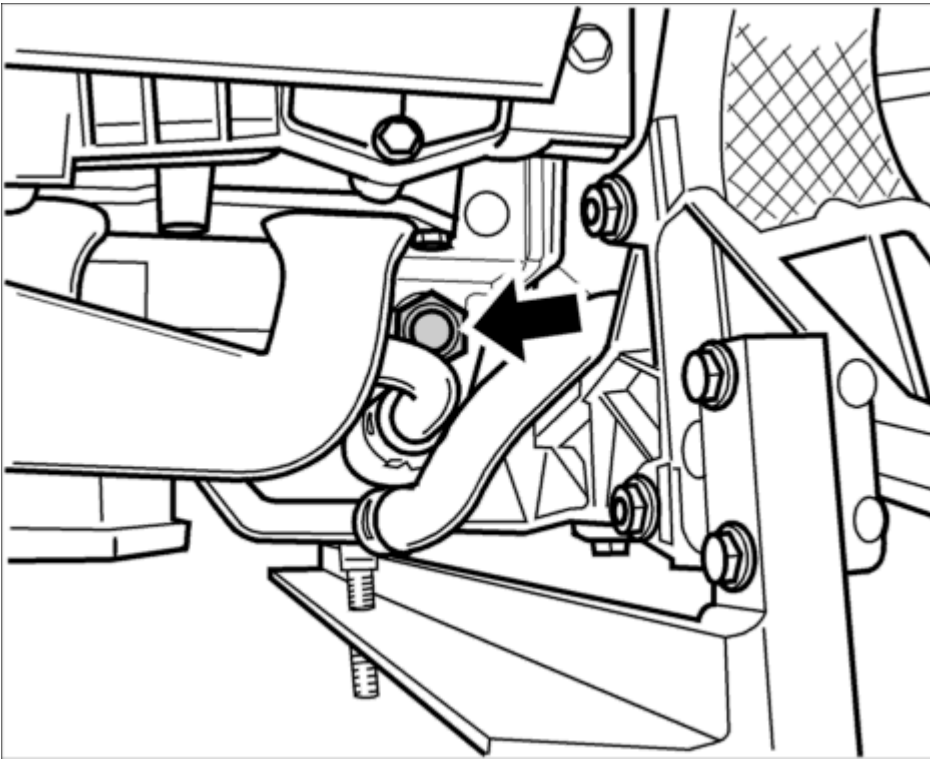


Fig. 125: Primary chain tensioner

Courtesy of PORSCHE OF NORTH AMERICA, INC.

5. Insert primary chain tensioner with new sealing ring (hexagon a/f 32) and tighten to the specified torque. -->
Tightening torque: 80 (59 ftlb.) Nm

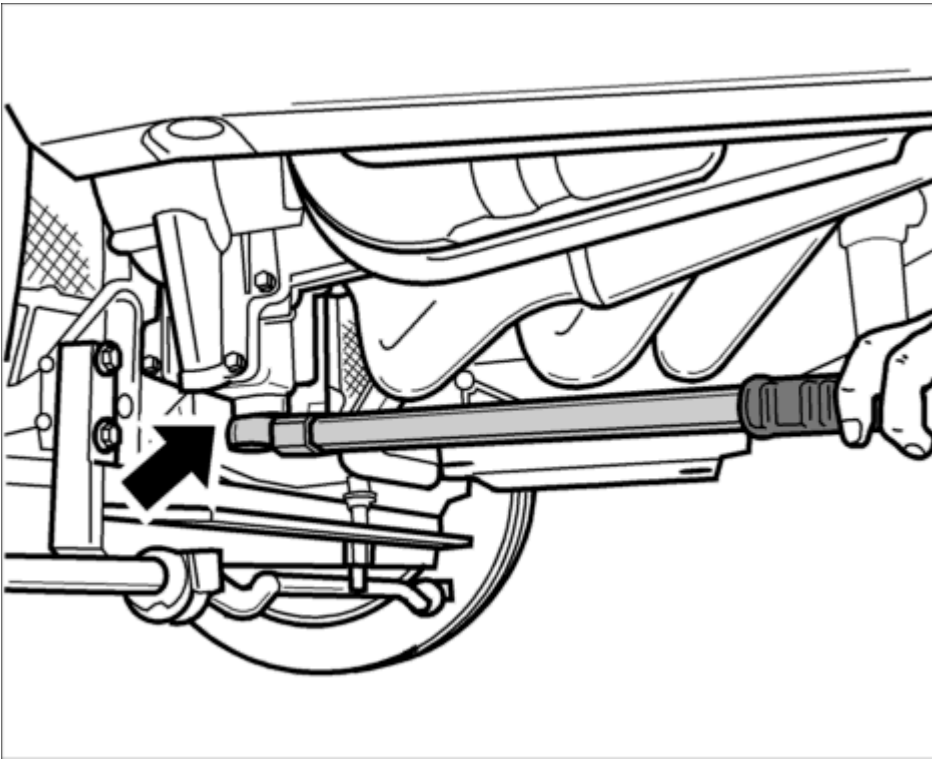


Fig. 126: Chain tensioner, cylinders 1 - 3

Courtesy of PORSCHE OF NORTH AMERICA, INC.

6. Insert chain tensioner for cylinder 1 - 3 with new sealing ring (hexagon a/f 32) and tighten to the specified torque. --> **Tightening torque: 80 (59 ftlb.) Nm**
7. Fasten coolant pipes on cylinder side 1 -3 with two M6 x 12 hexagon-head bolts. --> **Tightening torque: 10 (7.5 ftlb.) Nm**
8. Fit two new closure caps on cylinder head cover.
9. Pull locating pin out of crankshaft belt pulley.

Installing bearing cover for intermediate shaft - from engine number 61.504716

CAUTION: Risk of damage due to particles of dirt.

- **Oil bores/oil ducts can become blocked up.**

--> When working on the engine, absolute cleanliness is essential.

--> Lay removed engine parts on a clean base and cover them without fail.

--> Use the **cover for dust protection when fitting the engine NR.165** on the engine assembly support.

NOTE:

- *The same sealing ring and installation/removal procedure applies as for the "old" bearing cover.*
- *The new bearing cover can only be retrofitted along with the new intermediate shaft up to model year 2003.*

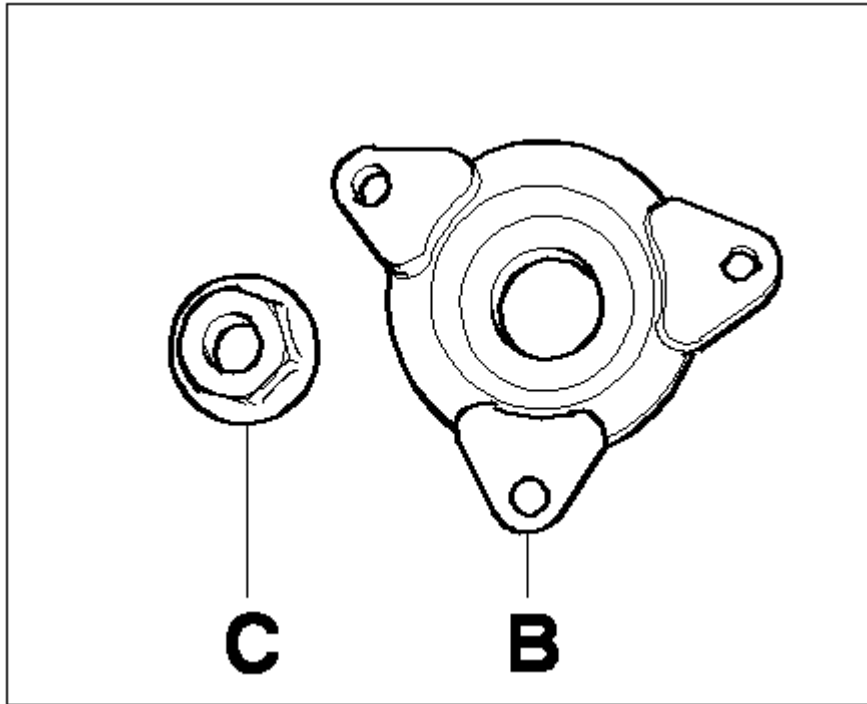


Fig. 127: New bearing cover for intermediate shaft
Courtesy of PORSCHE OF NORTH AMERICA, INC.

NOTE: Always observe specified engine number range.

New bearing cover

- B - Bearing cover 996.105.024.06
- C - Collar nut, M12 x 1.25

NOTE: *• Clean working area of bore for bearing cover and crankcase thoroughly using acetone or solvent naphtha.*

1. Before installing the new bearing cover, check the fitted bore (axial attachment surface, bore chamfers) on the crankcase for sharp edges and burrs. They should be removed with an oilstone or a polishing cloth. Remove any existing residue and clean the bore with a clean cloth soaked in solvent naphtha or acetone.

NOTE: *• Replace bearing cover or sealing ring for bearing cover --> 152355
Replacing sealing ring for intermediate shaft.*

2. Grease fitted bore in crankcase and new bearing cover (with new sealing ring) with special grease Optimoly MP3 (available from Porsche Parts Service) and place bearing cover in position.

NOTE:

- ***Replace collar nut M12 and coated M6 screws for bearing cover.***

3. Position three new, coated M6 x 20 screws on the crankcase and pull in the bearing cover by screwing in the screws uniformly. Tighten the screws. --> **Tightening torque: 10 (7.5 ftlb.) Nm**

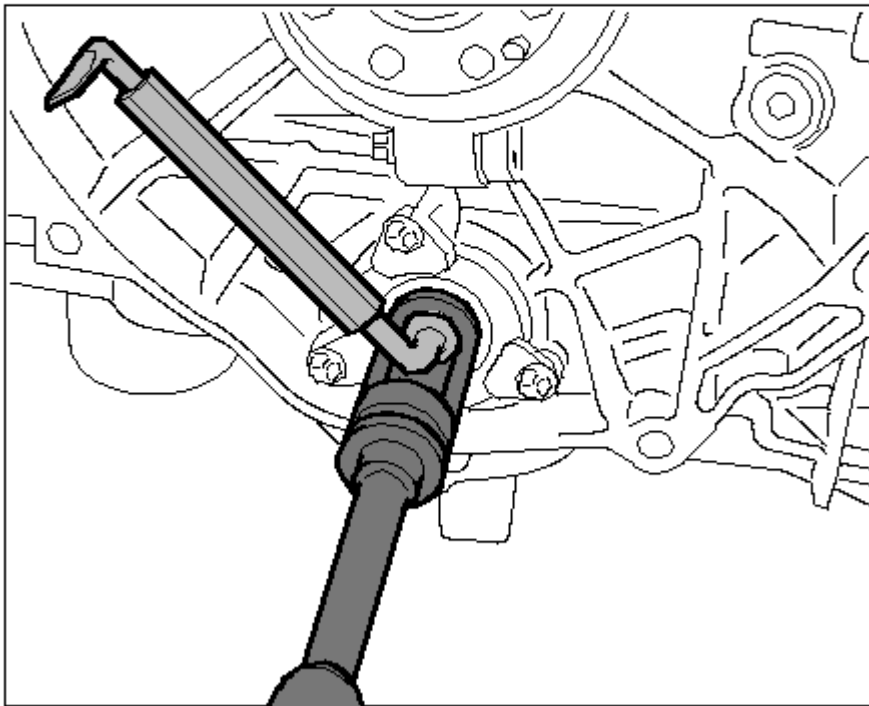


Fig. 128: Threaded joint with collar nut on bearing cover for intermediate shaft
Courtesy of PORSCHE OF NORTH AMERICA, INC.

4. Position new M12 x 1.25 collar nut on the threaded pin of the intermediate shaft. Then tighten the nut using special tool **assembly tool P 9673/1**. At the same time, counter with an angle screwdriver in the slotted threaded pin of the intermediate shaft. --> **Tightening torque : 20 (15 ftlb.) Nm +/-1 (0.5 ftlb.) Nm**

2007 Porsche Boxster

ENGINE Cylinder head, valve drive - Boxster And Cayman

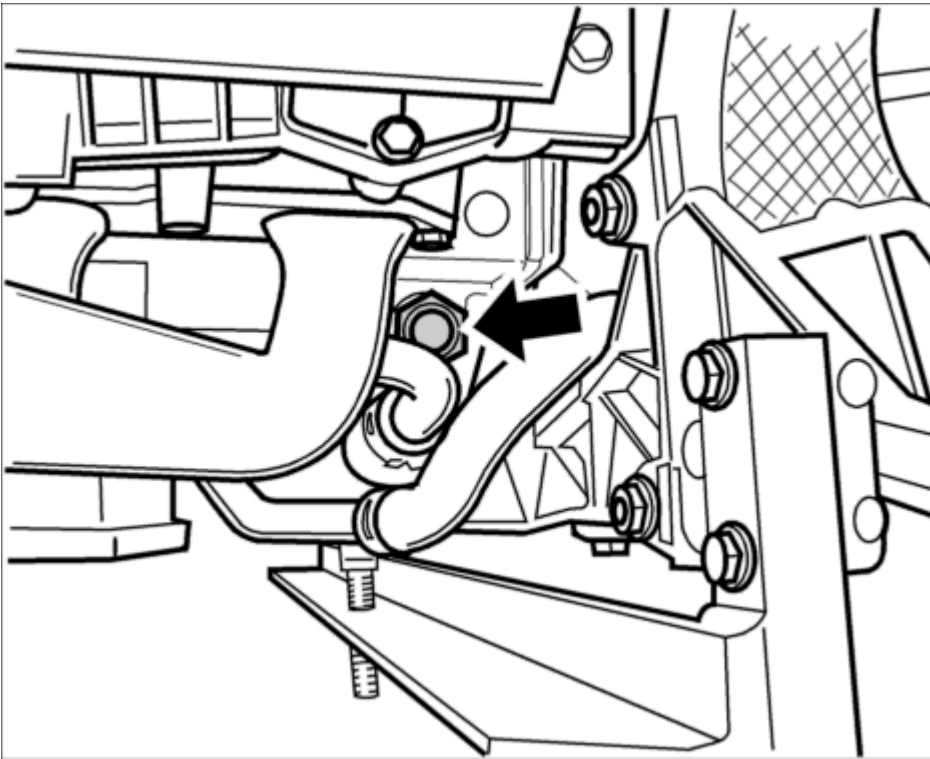


Fig. 129: Primary chain tensioner

Courtesy of PORSCHE OF NORTH AMERICA, INC.

5. Insert primary chain tensioner with new sealing ring (hexagon a/f 32) and tighten to the specified torque. -->
Tightening torque: 80 (59 ftlb.) Nm

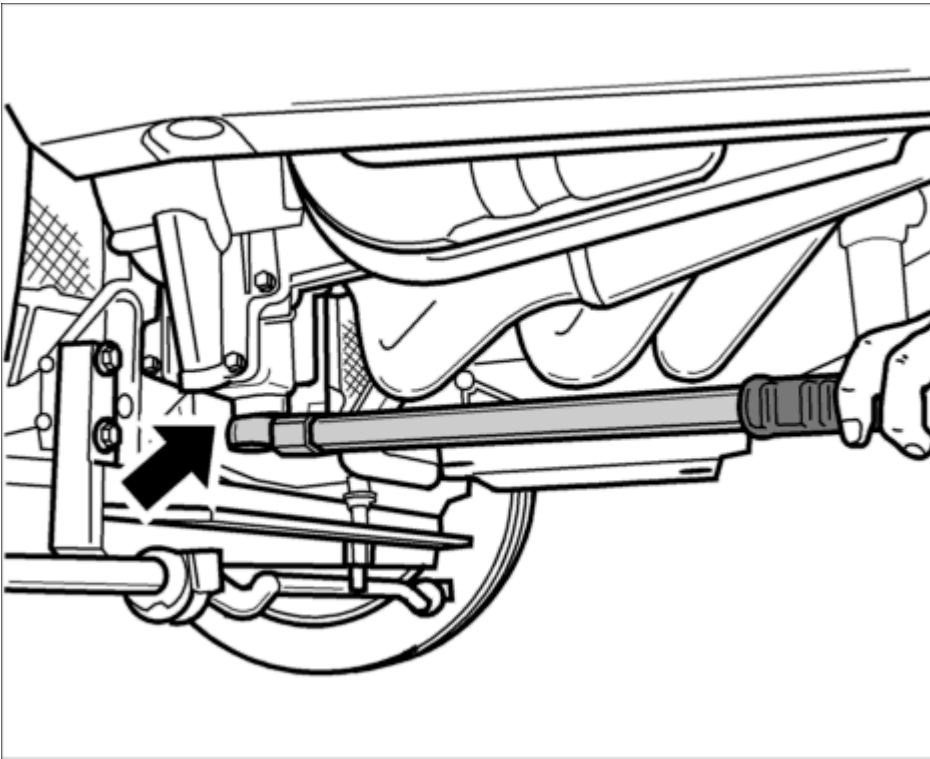


Fig. 130: Chain tensioner, cylinders 1 - 3

Courtesy of PORSCHE OF NORTH AMERICA, INC.

6. Insert chain tensioner for cylinder 1 - 3 with new sealing ring (hexagon a/f 32) and tighten to the specified torque. --> **Tightening torque: 80 (59 ftlb.) Nm**
7. Secure coolant pipe on cylinder side 1 -3 with two M6 x 12 hexagon-head bolts. --> **Tightening torque: 10 (7.5 ftlb.) Nm**
8. Fit new closure caps on cylinder head cover.
9. Pull locating pin out of crankshaft belt pulley.

SUBSEQUENT WORK FOR BEARING COVER FOR INTERMEDIATE SHAFT

Subsequent work for bearing cover for intermediate shaft

Tiptronic:

1. Install drive plate for converter. Refer to **13 63 19 Removing and installing drive plate for converter - as of MY 2005 (All Models)** .
2. Install automatic transmission. Refer to **37 35 19 Removing and installing automatic transmission - as of MY 2005 (Boxster, Boxster RHD)** .

Manual transmission:

2007 Porsche Boxster

ENGINE Cylinder head, valve drive - Boxster And Cayman

3. Install clutch. Refer to **30 50 19 Removing and installing clutch - as of MY 2005 (All Models)** .
4. Install double-mass flywheel. Refer to **13 60 19 Removing and installing flywheel - as of MY 2005 (All Models)** .
5. Install transmission. Refer to **34 35 19 Removing and installing transmission - as of MY 2005 (All Models)** .

All:

6. Filling in engine oil. Refer to **17 01 55 Engine oil and oil filter change - as of MY 2005 (All Models)** .

NOTE:

- ***Note the work instructions for disconnecting and reconnecting the battery.***

7. Connect the battery --> **27 06 IN WORK INSTRUCTIONS AFTER DISCONNECTING THE BATTERY - AS OF MY 2005 (ALL MODELS)** .

15 21 19 REMOVING AND INSTALLING BEARING COVER FOR INTERMEDIATE SHAFT - M96/26 - AS OF MY 2005 (BOXSTER S, BOXSTER S RHD)

TOOLS

Designation	Type	Number	Explanation	
cover for dust protection when fitting the engine	special tool	NR.165		
socket wrench	special tool	P 9110		
locating pins	special tool	P 9595/1		
puller	special tool	P 9673		
assembly tool	special tool	P 9673/1		
adjusting gauge	special tool	P 9686		

PRELIMINARY WORK FOR BEARING COVER FOR INTERMEDIATE SHAFT

Preliminary work for bearing cover for intermediate shaft

NOTE:

- ***Note the work instructions for disconnecting and reconnecting the battery.***

1. Disconnect the battery --> **27 06 IN WORK INSTRUCTIONS AFTER DISCONNECTING THE BATTERY - AS OF MY 2005 (ALL MODELS)** .
2. Drain engine oil. Refer to **17 01 55 Engine oil and oil filter change - as of MY 2005 (All Models)** .

Tiptronic:

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3. Remove automatic transmission. Refer to **37 35 19 Removing and installing automatic transmission - as of MY 2005 (Boxster S, Boxster S RHD)** .

4. Remove drive plate for converter. Refer to **13 63 19 Removing and installing drive plate for converter - as of MY 2005 (All Models)** .

Manual transmission:

5. Remove manual transmission. Refer to **34 35 19 Removing and installing transmission - as of MY 2005 (All Models)** .

6. Remove clutch. Refer to **30 50 19 Removing and installing clutch - as of MY 2005 (All Models)** .

7. Remove double-mass flywheel. Refer to **13 60 19 Removing and installing flywheel - as of MY 2005 (All Models)** .

REMOVING BEARING COVER FOR INTERMEDIATE SHAFT

Removing bearing cover for intermediate shaft - up to engine number 62.504094

CAUTION: Timing chain may jump over.

- Risk of engine damage

--> Following removal of the chain tensioner, the crankshaft must not be turned under any circumstances.

CAUTION: Risk of damage due to particles of dirt.

- Oil bores/oil ducts can become blocked up.

--> When working on the engine, absolute cleanliness is essential.

--> Lay removed engine parts on a clean base and cover them without fail.

--> Use the **cover for dust protection when fitting the engine NR.165** on the engine assembly support.

NOTE: Always observe specified engine number range.

Bearing covers

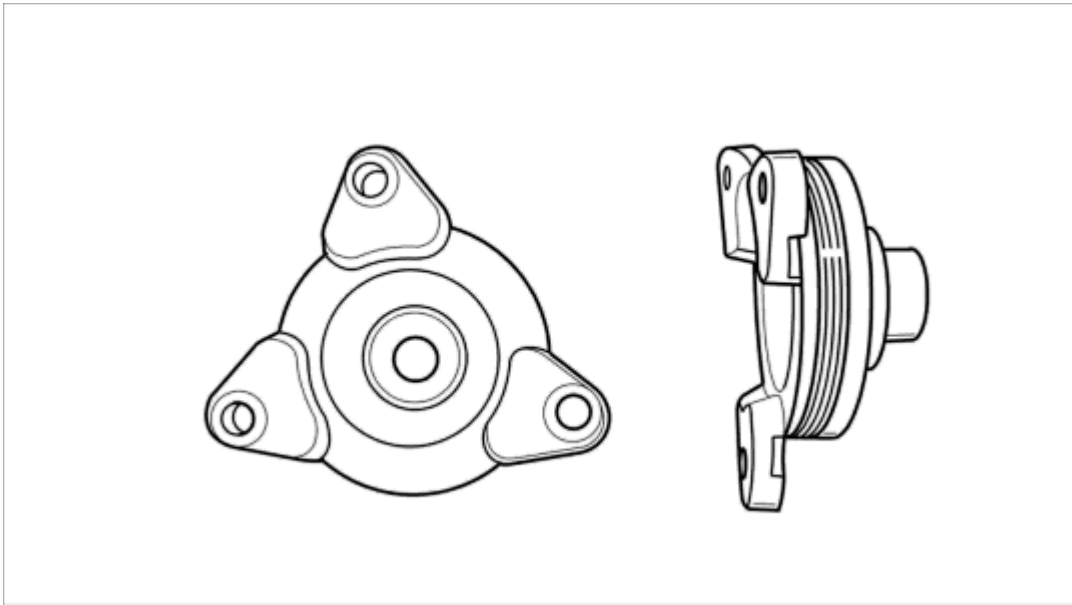


Fig. 131: Bearing cover with sealing ring
Courtesy of PORSCHE OF NORTH AMERICA, INC.

1. Lever out two green closure caps on pulley side of cylinder bank 1 - 3.

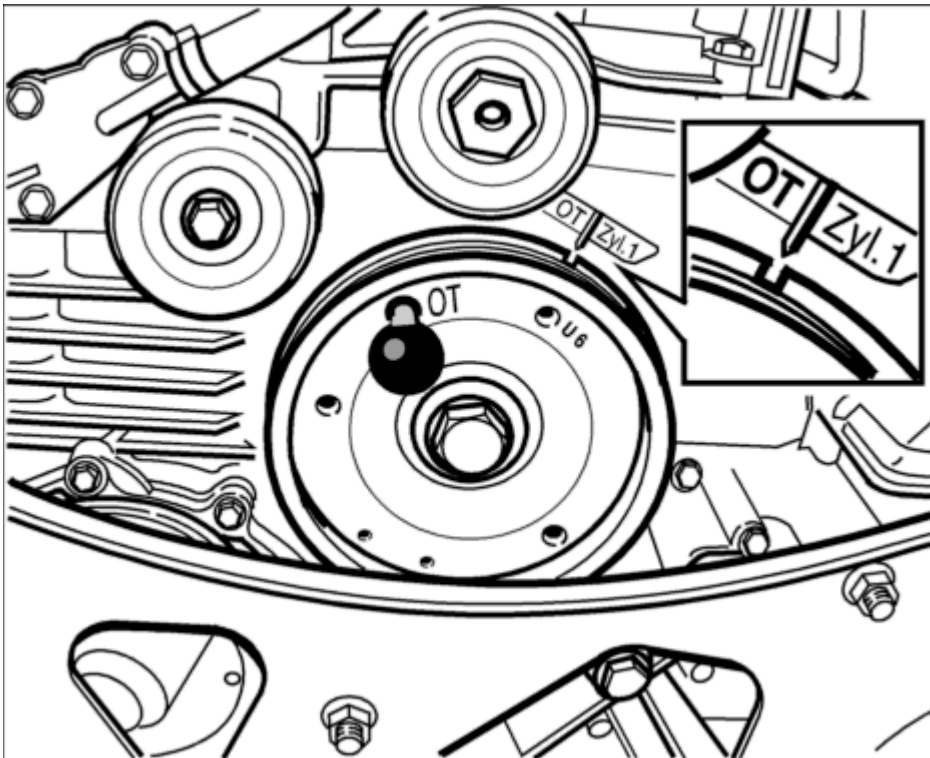


Fig. 132: Fixing pulley
Courtesy of PORSCHE OF NORTH AMERICA, INC.

2. Turn the engine at the hexagon-head bolt (a/f 24) of the crankshaft belt pulley clockwise to overlapping TDC

of cylinder bank 1 and fix it with special tool **locating pins P 9595/1**.

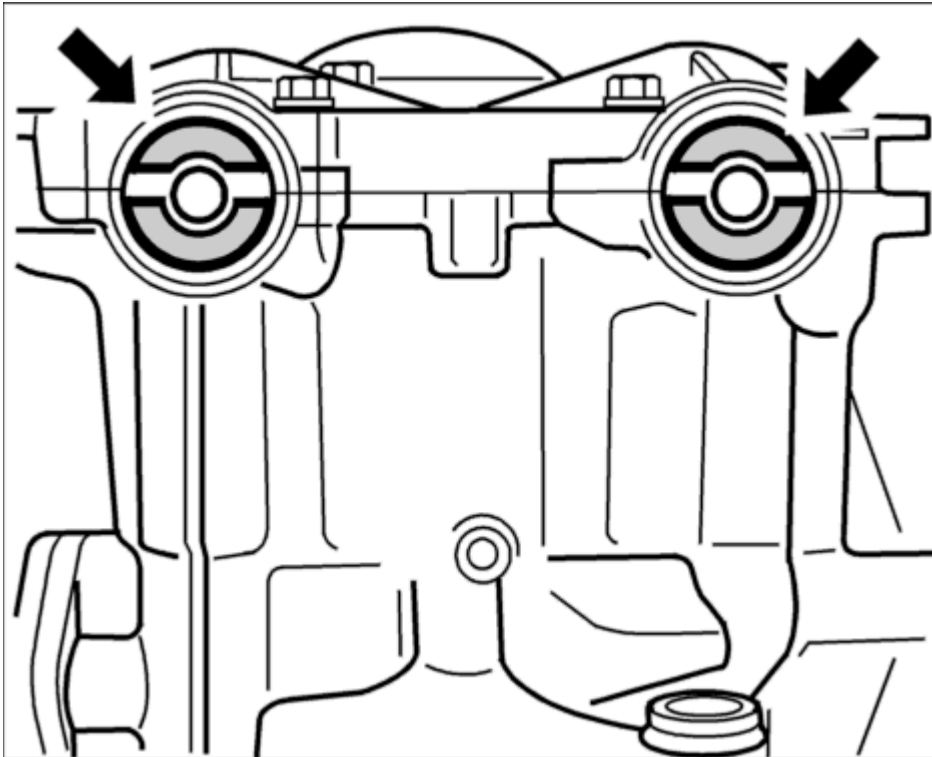


Fig. 133: Cam slot position at overlapping TDC of cylinder 1
Courtesy of PORSCHE OF NORTH AMERICA, INC.

NOTE:

- ***For checking with the adjusting gauge, the timing adjustment must be correct.***

3. To check the camshaft adjustment, insert **adjusting gauge P 9686** for camshaft into the camshaft slots (pulley side) (inscription on gauge and small circular cut-outs point towards cylinder head cover). If the gauge cannot be inserted, rotate the crankshaft a further 360° and secure it again.

4. Unscrew two M6 x 12 hexagon-head bolts on the coolant pipe mount (Tiptronic) at cylinder side 1 - 3.

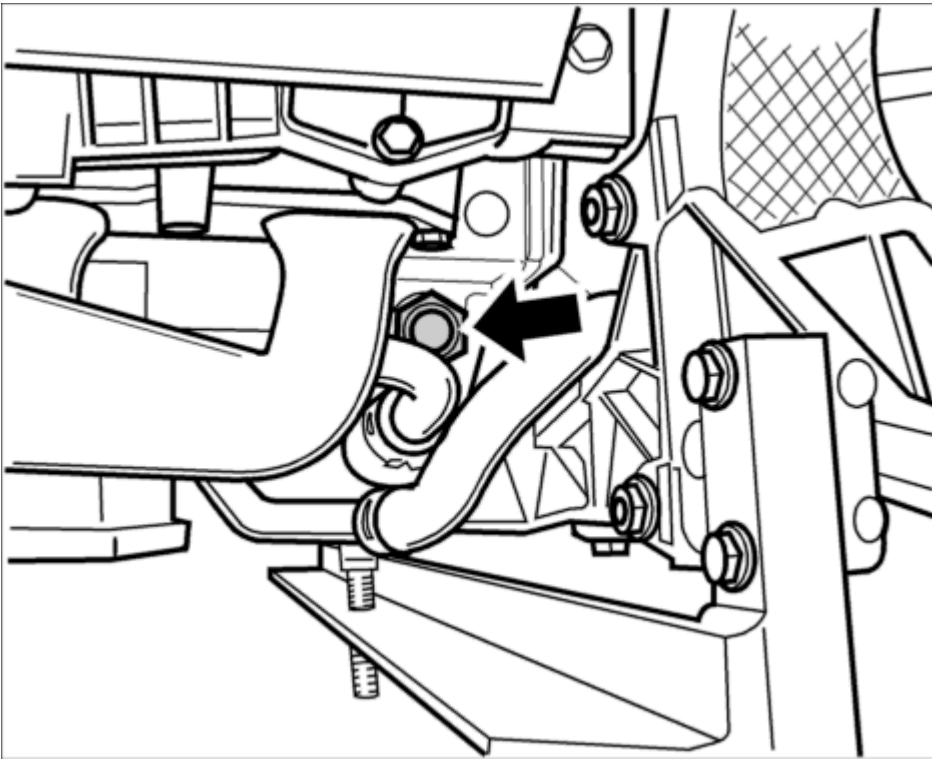


Fig. 134: Primary chain tensioner

Courtesy of PORSCHE OF NORTH AMERICA, INC.

5. Remove primary chain tensioner (hexagon socket a/f 32).

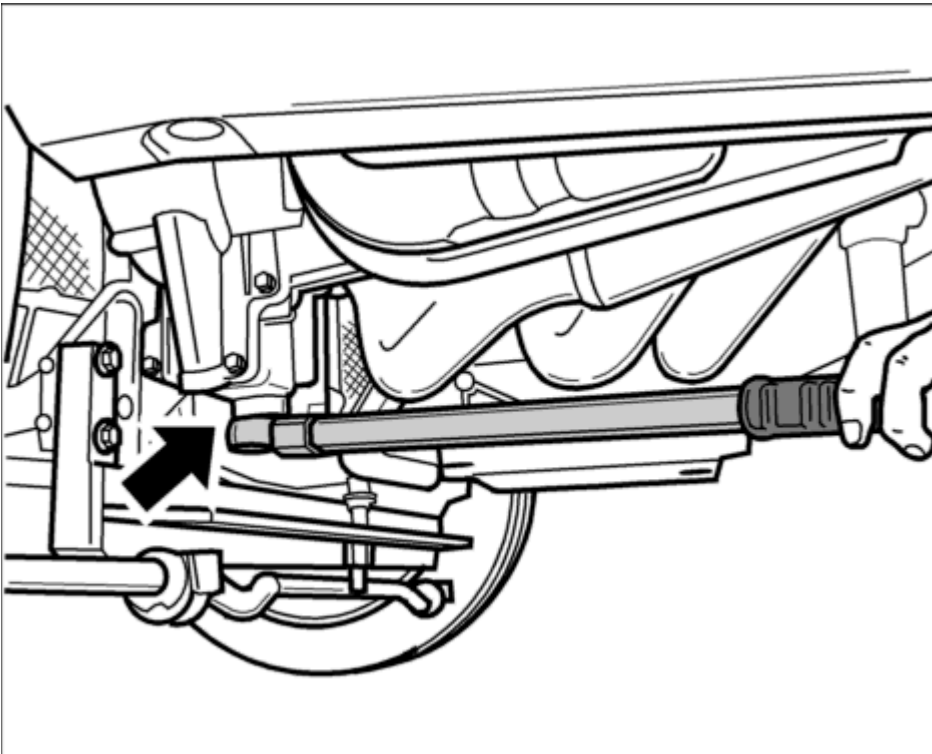
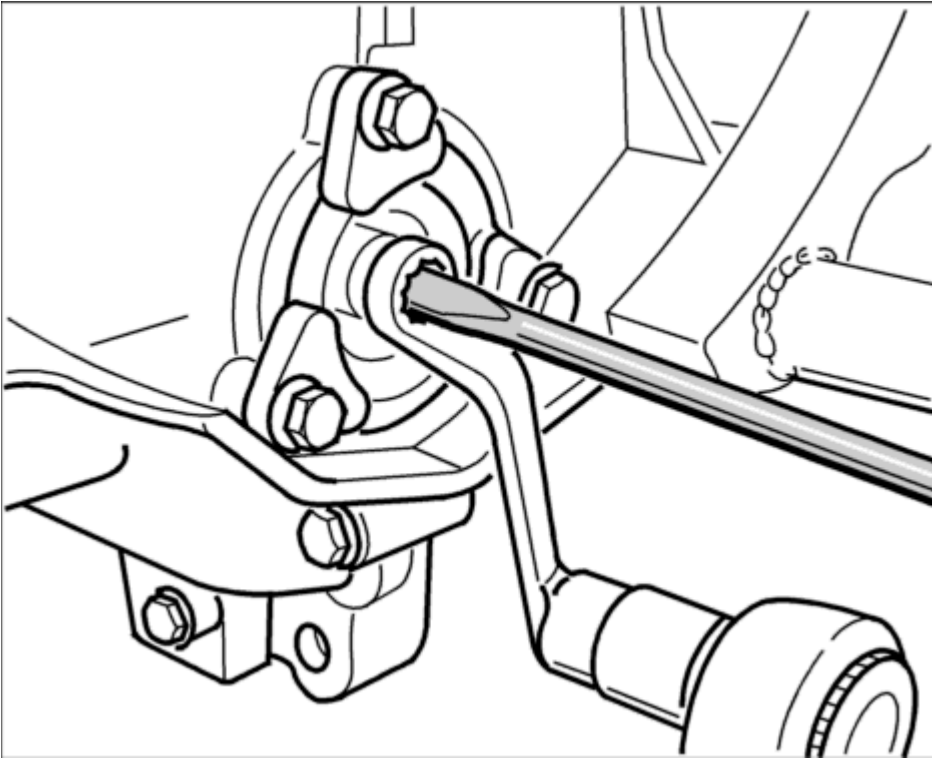


Fig. 135: Chain tensioner, cylinders 1 - 3

Courtesy of PORSCHE OF NORTH AMERICA, INC.

6. Remove chain tensioner, cylinder bank 1 - 3 (hexagon socket a/f 32).

**Fig. 136: Collar nut for bearing cover**

Courtesy of PORSCHE OF NORTH AMERICA, INC.

NOTE:

- *To make it easier to remove the bearing cover, spray the sealing surface with anti-rust agent.*

7. Unscrew M8 hexagon collar nut on the bearing cover of the intermediate shaft with special tool **socket wrench P 9110**, while at the same time countering at the slotted threaded pin on the intermediate shaft with a screwdriver.

8. Unscrew the three M6 x 20 hexagon-head bolts (coated) on the intermediate-shaft flange. Replace coated screws during installation and clean threaded bores.

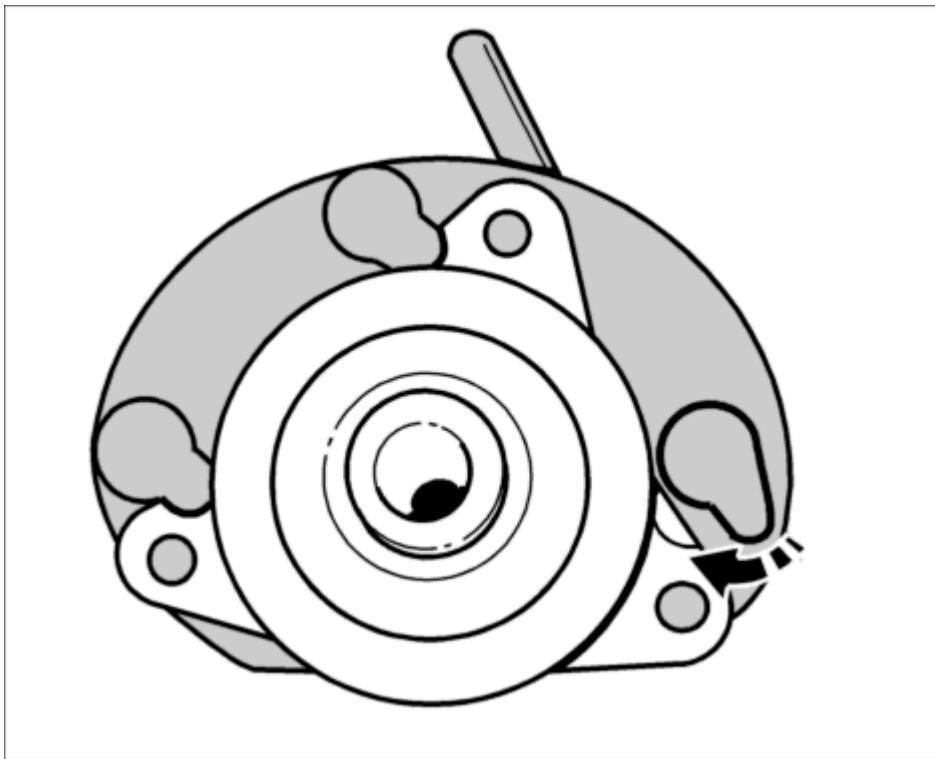


Fig. 137: Puller on bearing cover: view when removed

Courtesy of PORSCHE OF NORTH AMERICA, INC.

NOTE:

- *Remove bearing cover using special tool*
- *After removing the bearing cover, do not press the threaded bolts of the intermediate shaft.*

puller P 9673. If this is not available, lever the bearing cover out carefully with two screwdrivers so as not to damage the sealing surfaces. Turning several times to the left and right loosens the bearing cover.

9. Position special tool **puller P 9673** at the bearing cover grooves and secure by turning the locking lever anti-clockwise.

2007 Porsche Boxster

ENGINE Cylinder head, valve drive - Boxster And Cayman

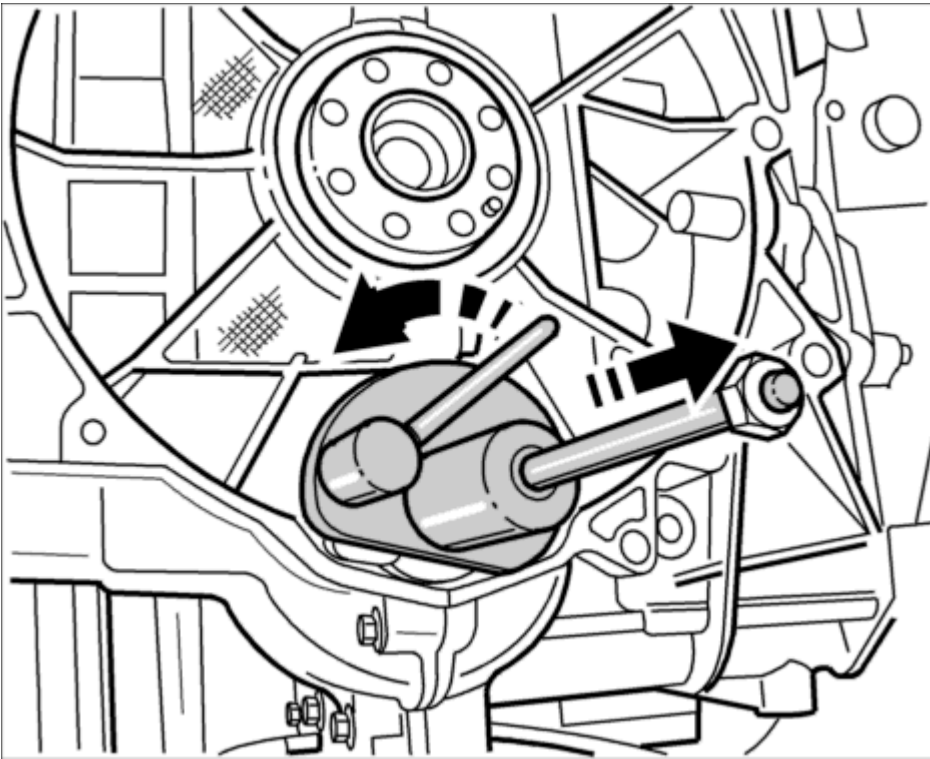


Fig. 138: Removing bearing cover

Courtesy of PORSCHE OF NORTH AMERICA, INC.

10. Pull the slide hammer on the puller a number of times against the stop nuts while countering the tool at the same time with the other hand.

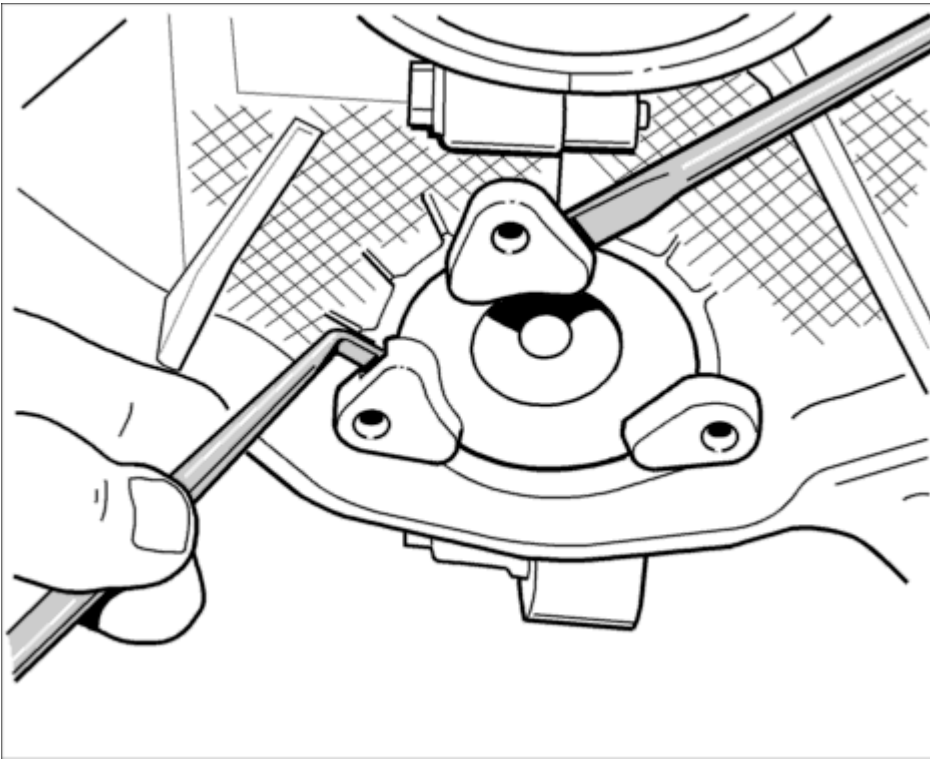


Fig. 139: Levering out bearing cover

Courtesy of PORSCHE OF NORTH AMERICA, INC.

11. If the puller is not available, lever the bearing cover out carefully using two screwdrivers (or angle screwdrivers), for example. Move the bearing cover frequently to the left and right to make the levering easier. Do not damage the sealing surfaces.

Removing bearing cover for intermediate shaft - from engine number 62.504095

CAUTION: Timing chain may jump over.

- Risk of engine damage

--> Following removal of the chain tensioner, the crankshaft must not be turned under any circumstances.

CAUTION: Risk of damage due to particles of dirt.

- Oil bores/oil ducts can become blocked up.

--> When working on the engine, absolute cleanliness is essential.

--> Lay removed engine parts on a clean base and cover them without fail.

--> Use the **cover for dust protection when fitting the engine NR.165** on the engine assembly support.

NOTE:

- *The same sealing ring and installation/removal procedure applies as for the "old" bearing cover.*
- *The new bearing cover can only be retrofitted along with the new intermediate shaft up to model year 2003.*

NOTE:

Always observe specified engine number range.

Overview of bearing covers for intermediate shaft.

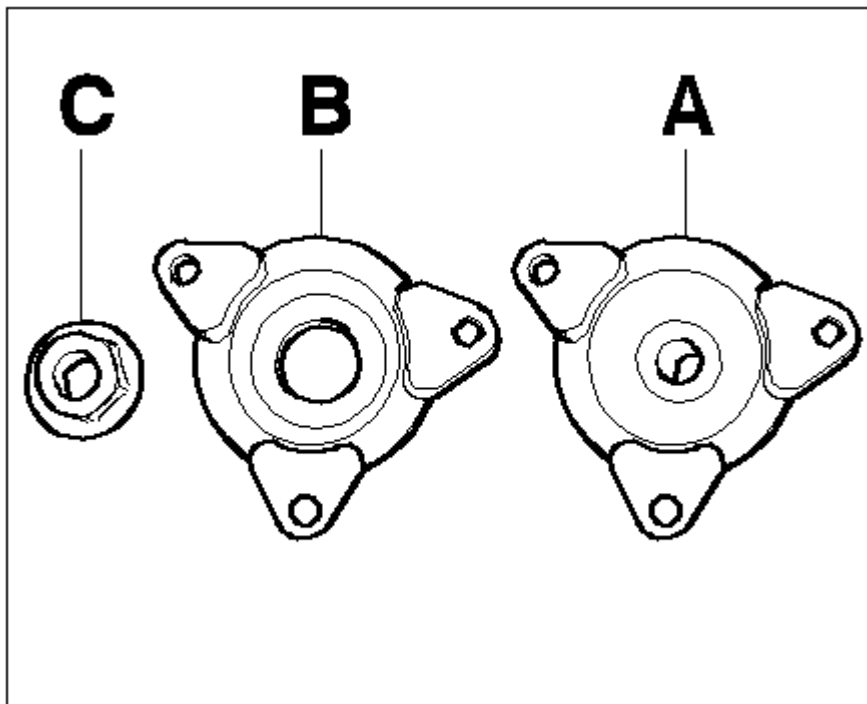


Fig. 140: Differentiation of bearing covers for intermediate shaft
 Courtesy of PORSCHE OF NORTH AMERICA, INC.

- A - Bearing cover 996.105.024.01
- B - Bearing cover 996.105.024.06
- C - Collar nut, M12 x 1.25

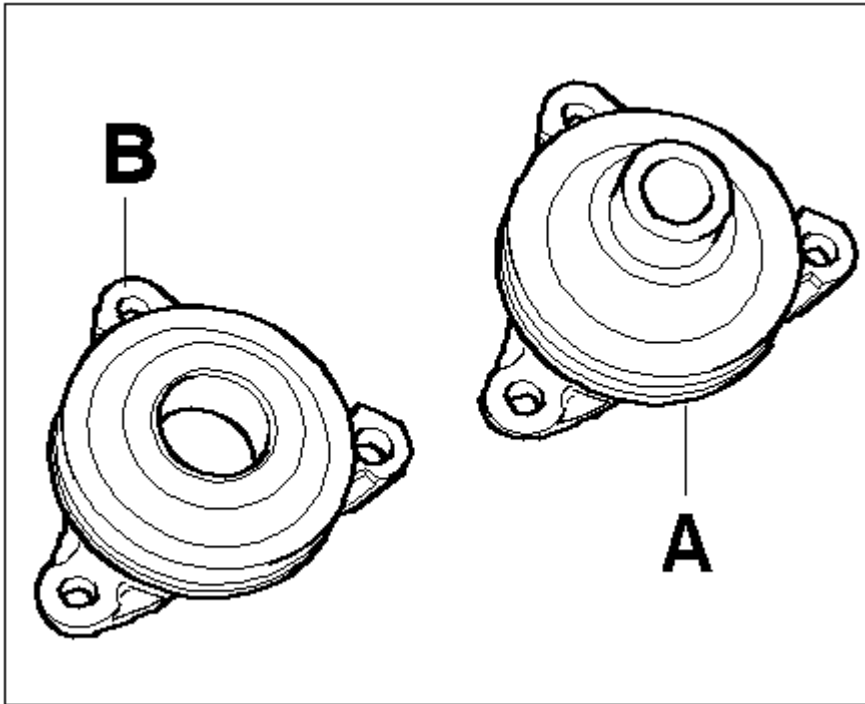


Fig. 141: Rear view of bearing cover for intermediate shaft
Courtesy of PORSCHE OF NORTH AMERICA, INC.

Rear of bearing cover

- A - Rear of bearing cover 996.105.024.01
- B - Rear of bearing cover 996.105.024.06

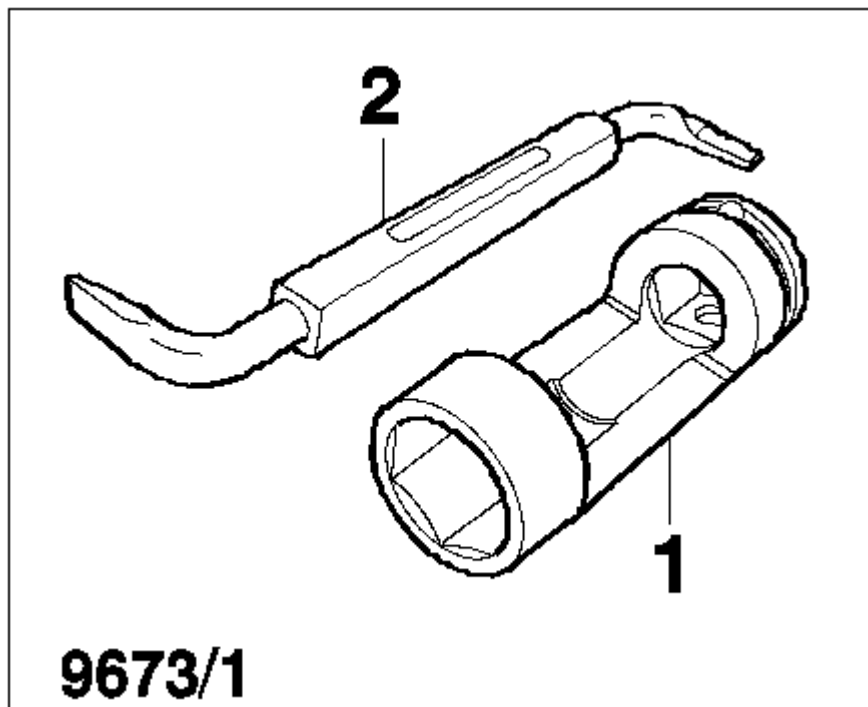


Fig. 142: Special tool 9673/1

Courtesy of PORSCHE OF NORTH AMERICA, INC.

Use the special tool assembly tool P 9673/1 for the M12 collar nut threaded joint.

1. Lever out two green closure caps on pulley side of cylinder bank 1 - 3.

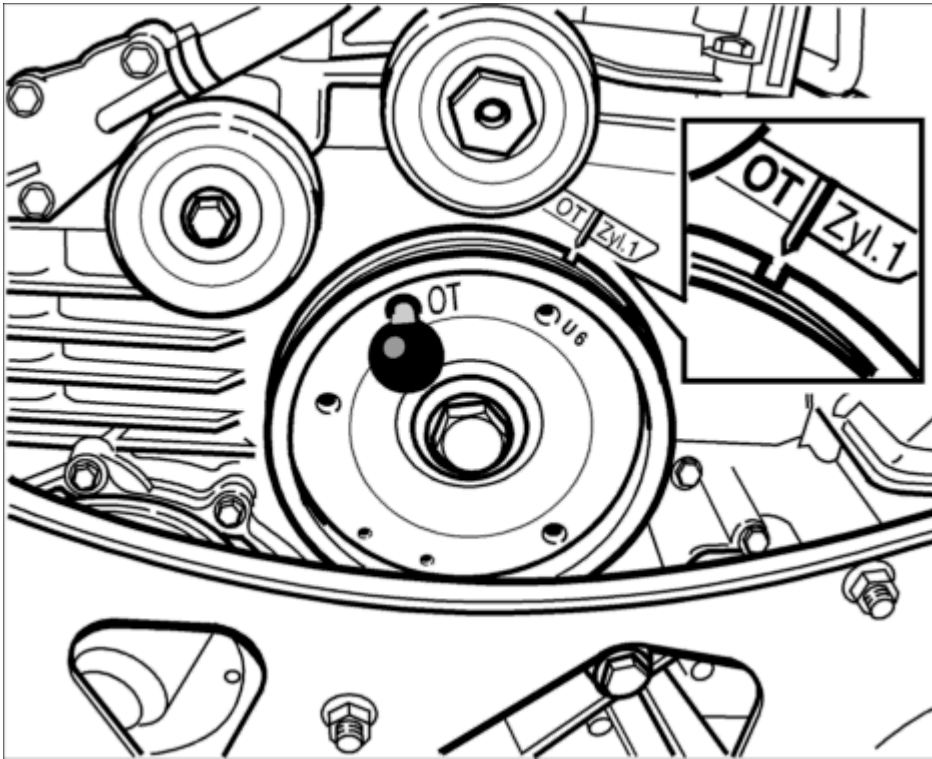


Fig. 143: Fixing pulley

Courtesy of PORSCHE OF NORTH AMERICA, INC.

2. Turn the engine at the hexagon-head bolt (a/f 24) of the crankshaft belt pulley clockwise to overlapping TDC of cylinder bank 1 - 3 and fix it with special tool locating pins P 9595/1.

NOTE:

- *For checking with the adjusting gauge, the timing adjustment must be correct.*

3. To check the camshaft adjustment, insert adjusting gauge P 9686 for camshaft into the camshaft slots (pulley side) (inscription on gauge pointing towards cylinder head cover). If the gauge cannot be inserted, rotate the crankshaft a further 360° and secure it again.

4. Unscrew two M6 x 12 hexagon-head bolts on the coolant pipe at cylinder side 1 - 3 (Tiptronic).

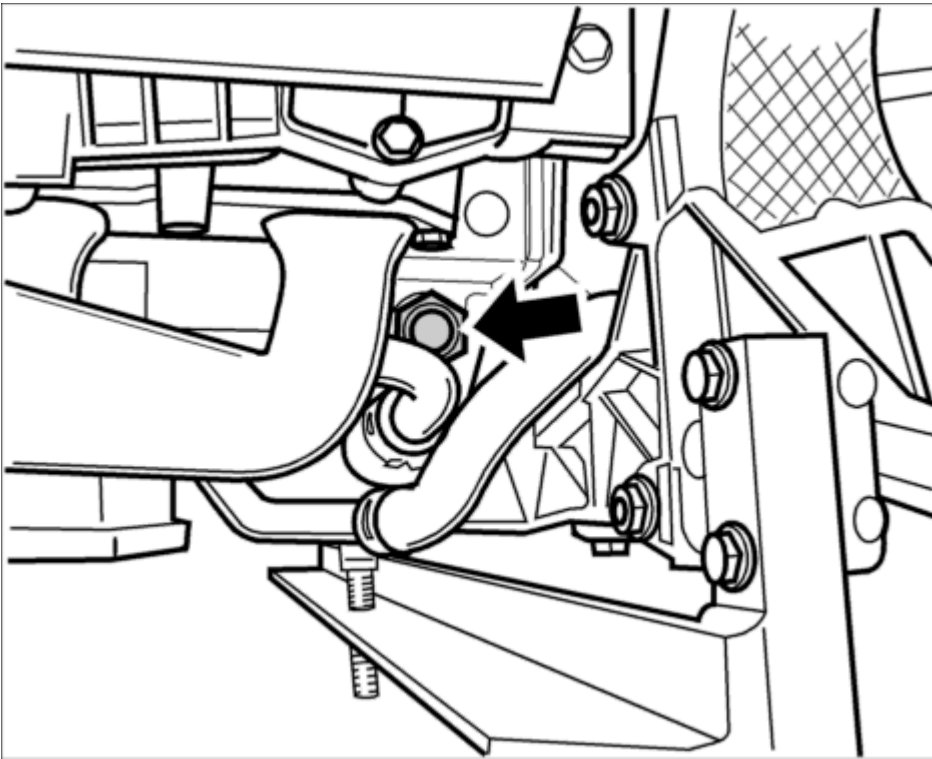


Fig. 144: Primary chain tensioner

Courtesy of PORSCHE OF NORTH AMERICA, INC.

5. Remove primary chain tensioner (hexagon socket a/f 32).

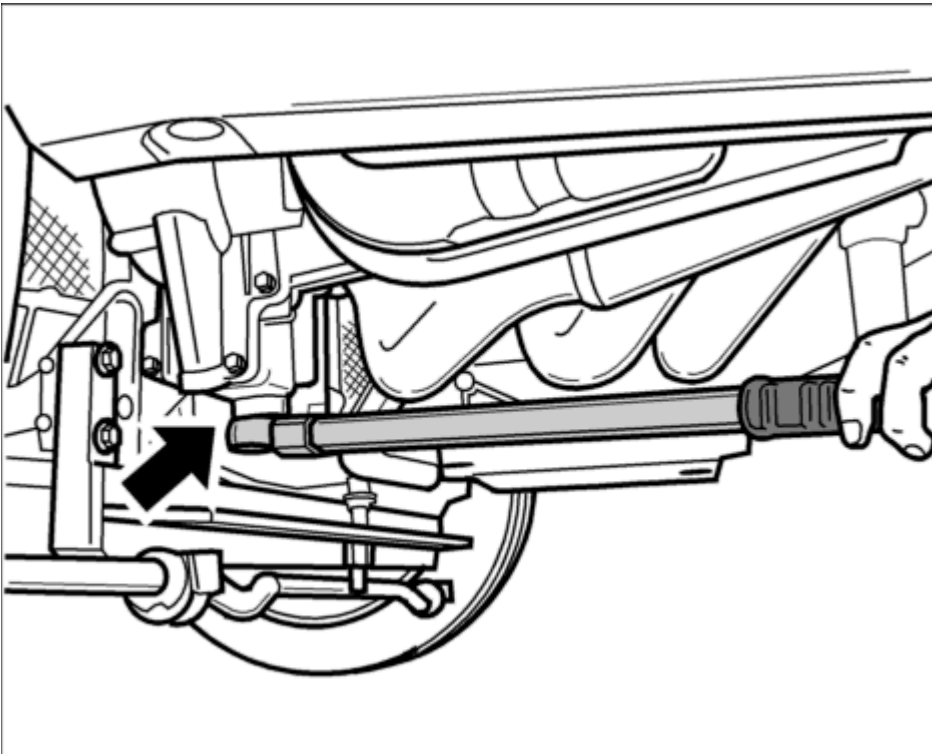


Fig. 145: Chain tensioner, cylinders 1 - 3

Courtesy of PORSCHE OF NORTH AMERICA, INC.

6. Remove chain tensioner, cylinder bank 1 - 3 (hexagon socket a/f 32).

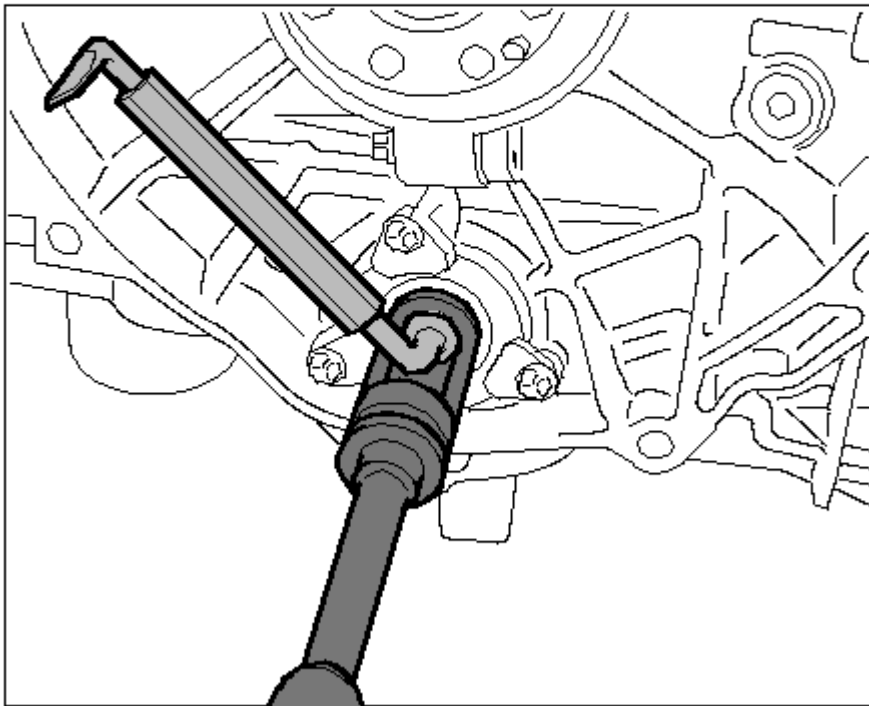


Fig. 146: Threaded joint with collar nut on bearing cover for intermediate shaft

Courtesy of PORSCHE OF NORTH AMERICA, INC.

NOTE:

- *To make it easier to remove the bearing cover, spray the sealing surface with anti-rust agent.*

7. Loosen M12 hexagon collar nut (a/f 22) on bearing cover for intermediate shaft with special tool **assembly tool P 9673/1** and screw it off --> *Threaded joint with collar nut on bearing cover for intermediate shaft* . See **Fig. 146**.

8. Unscrew the three M6 x 20 fastening screws (coated) on the intermediate-shaft flange. Replace screws during installation and clean thread in crankcase.

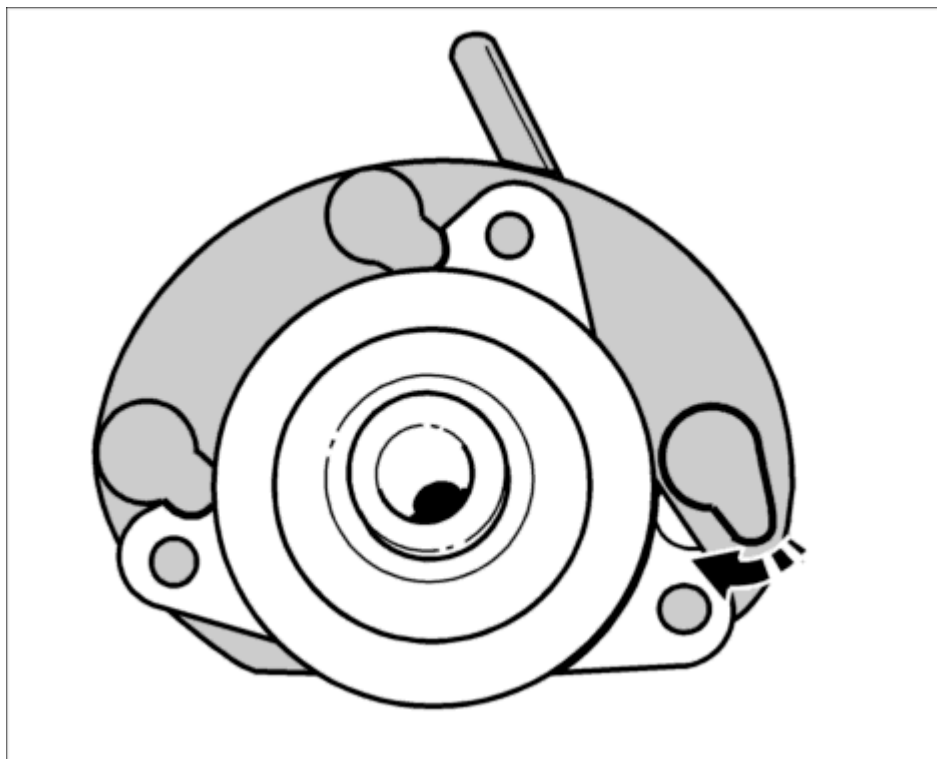


Fig. 147: Puller on bearing cover: view when removed

Courtesy of PORSCHE OF NORTH AMERICA, INC.

NOTE:

- *Remove bearing cover using special tool*
- *After removing the bearing cover, do not press the threaded bolts of the intermediate shaft.*

puller P 9673. If this is not available, lever the bearing cover out carefully with two screwdrivers so as not to damage the sealing surfaces. Turning several times to the left and right loosens the bearing cover.

9. Position special tool **puller P 9673** at the bearing cover grooves and secure by turning the locking lever anti-clockwise.

2007 Porsche Boxster

ENGINE Cylinder head, valve drive - Boxster And Cayman

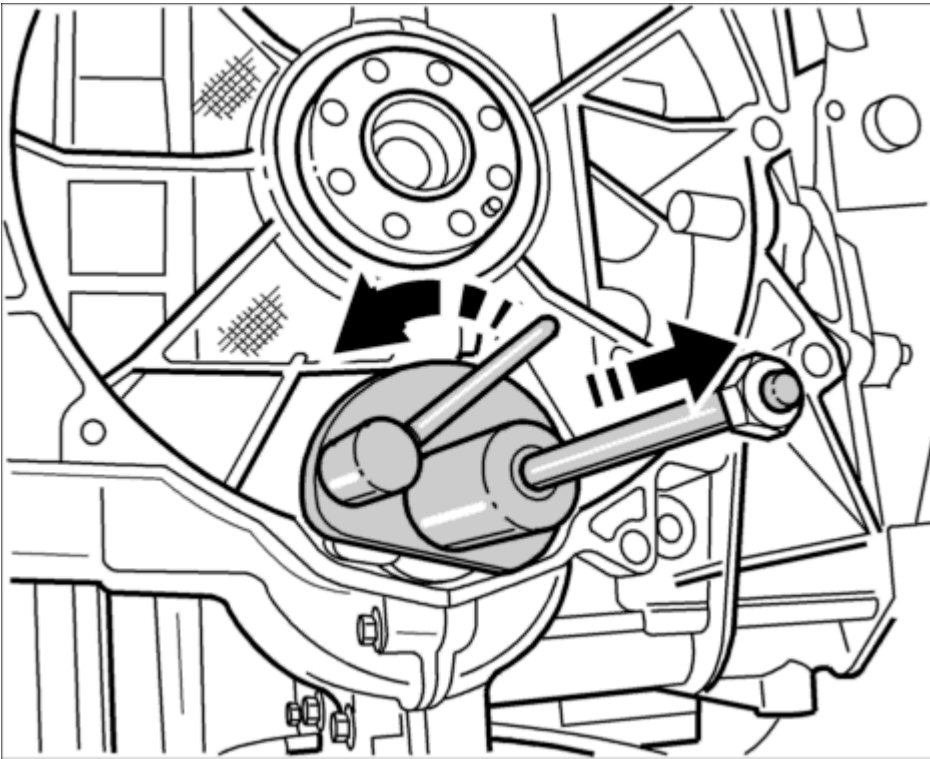


Fig. 148: Removing bearing cover

Courtesy of PORSCHE OF NORTH AMERICA, INC.

10. Pull the slide hammer on the puller a number of times against the stop nuts while countering the tool at the same time with the other hand.

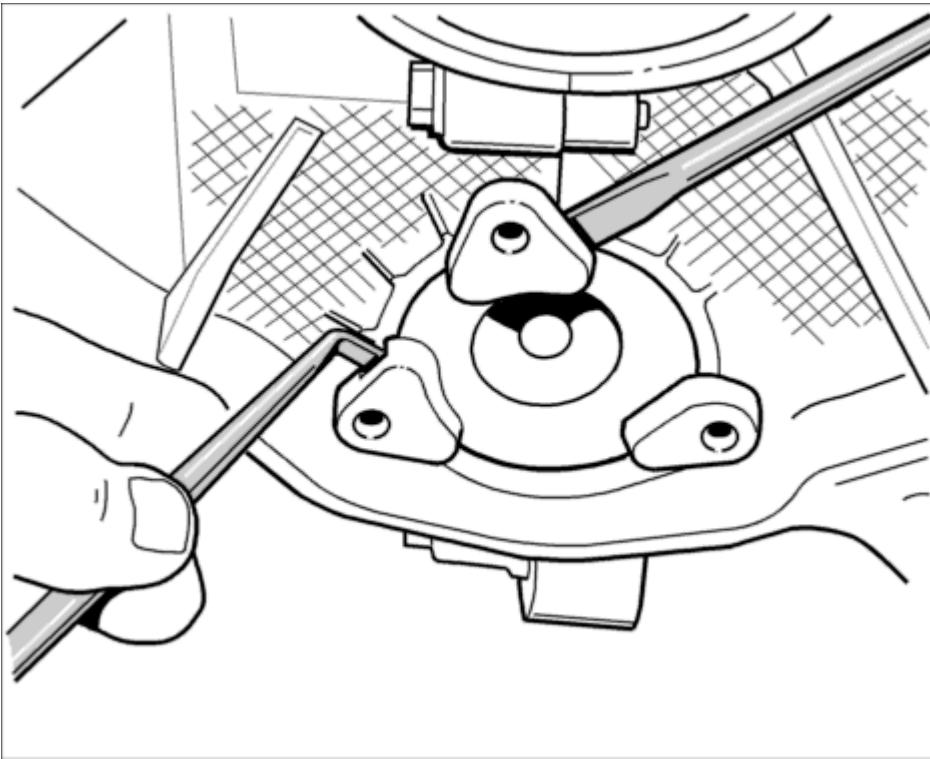


Fig. 149: Levering out bearing cover

Courtesy of PORSCHE OF NORTH AMERICA, INC.

11. If the puller is not available, lever the bearing cover out carefully using two screwdrivers (or angle screwdrivers). Move the bearing cover a number of times to the left and right to make levering easier. Do not damage the sealing surfaces.

INSTALLING BEARING COVER FOR INTERMEDIATE SHAFT

Installing bearing cover for intermediate shaft - up to engine number 62.504094

CAUTION: Risk of damage due to particles of dirt.

- Oil bores/oil ducts can become blocked up.

--> When working on the engine, absolute cleanliness is essential.

--> Lay removed engine parts on a clean base and cover them without fail.

--> Use the cover for dust protection when fitting the engine NR.165 on the engine assembly support.

NOTE:

- *Clean working area of bore for bearing cover and crankcase thoroughly using acetone or solvent naphtha.*

1. Before installing the new bearing cover, check the fitted bore (axial attachment surface, bore chamfers) on

the crankcase for sharp edges and burrs. They should be removed with an oilstone or a polishing cloth. Remove any existing residue and clean the bore with a clean cloth soaked in solvent naphtha or acetone.

NOTE:

- ***Replace bearing cover or sealing ring for bearing cover --> 152355
Replacing sealing ring for intermediate shaft.***

NOTE: Always observe specified engine number range.

2. Grease fitted bore in crankcase and new bearing cover (with new sealing ring) with special grease Optimoly MP3 (available from Porsche Parts Service) and place bearing cover in position.

NOTE:

- ***Replace collar nut M8 x 1 and coated M6 screws for bearing cover.***

3. Position three new, coated M6 x 20 screws on the crankcase and pull in the bearing cover by screwing in the screws uniformly. Tighten the screws. --> **Tightening torque: 10 (7.5 ftlb.) Nm**

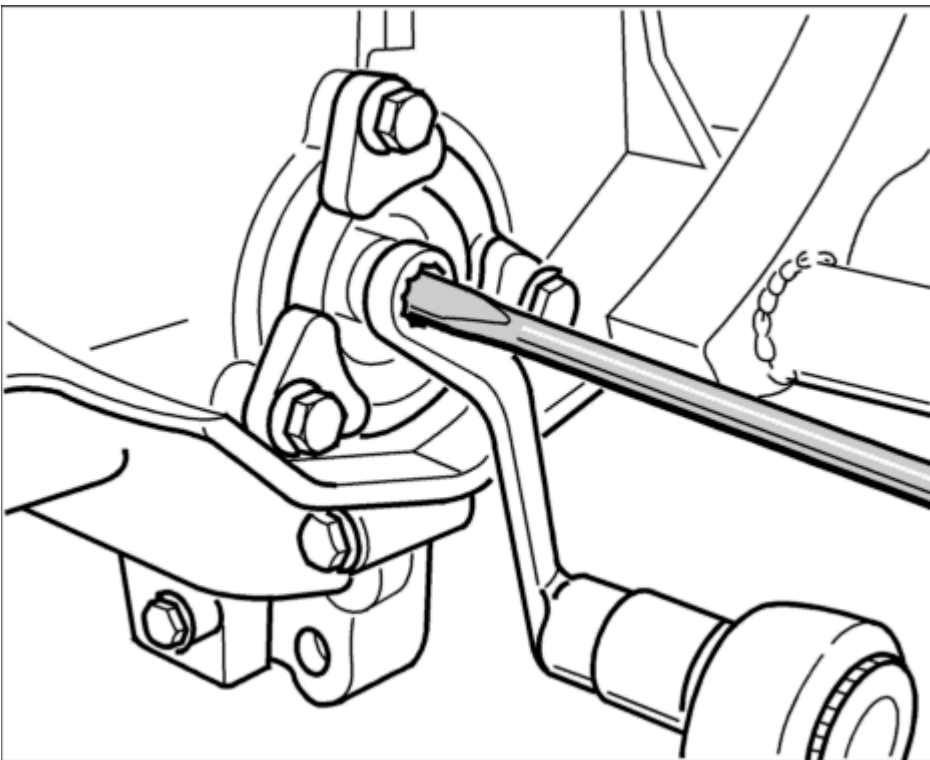


Fig. 150: Collar nut for bearing cover

Courtesy of PORSCHE OF NORTH AMERICA, INC.

4. Position new M8 x 1 collar nut on the threaded pin of the intermediate shaft. Then tighten the nut using special tool **socket wrench P 9110**. At the same time, counter with a screwdriver in the slotted threaded pin of the intermediate shaft. --> **Tightening torque: 12 (9 ftlb.) Nm +1 (0.5 ftlb.) Nm**

2007 Porsche Boxster

ENGINE Cylinder head, valve drive - Boxster And Cayman

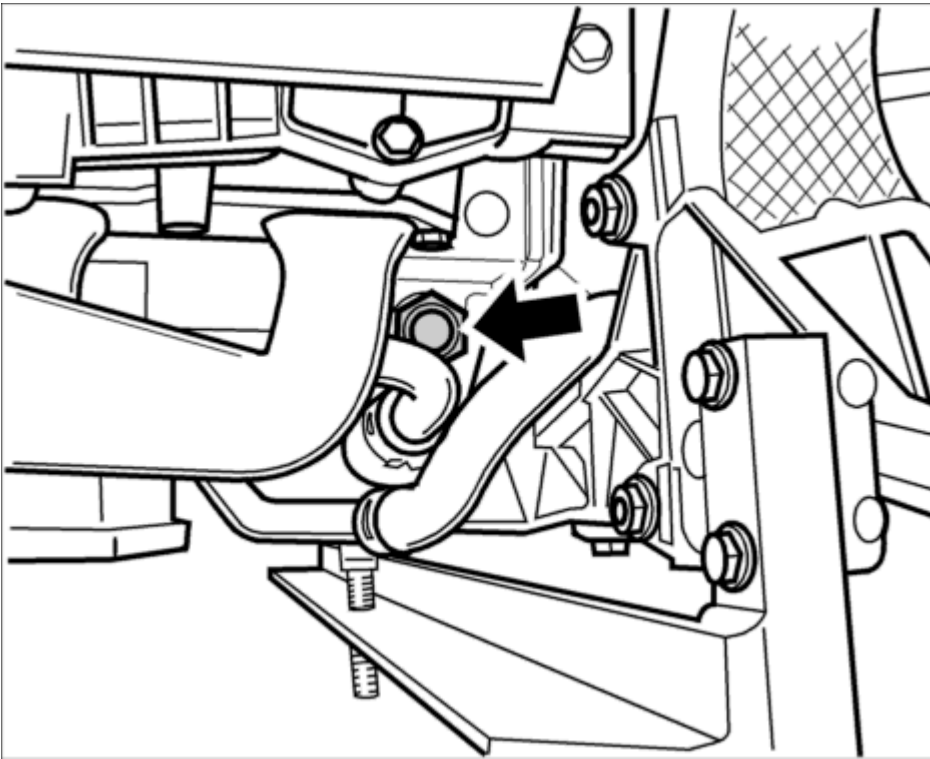


Fig. 151: Primary chain tensioner

Courtesy of PORSCHE OF NORTH AMERICA, INC.

5. Insert primary chain tensioner with new sealing ring (hexagon a/f 32) and tighten to the specified torque. -->
Tightening torque: 80 (59 ftlb.) Nm

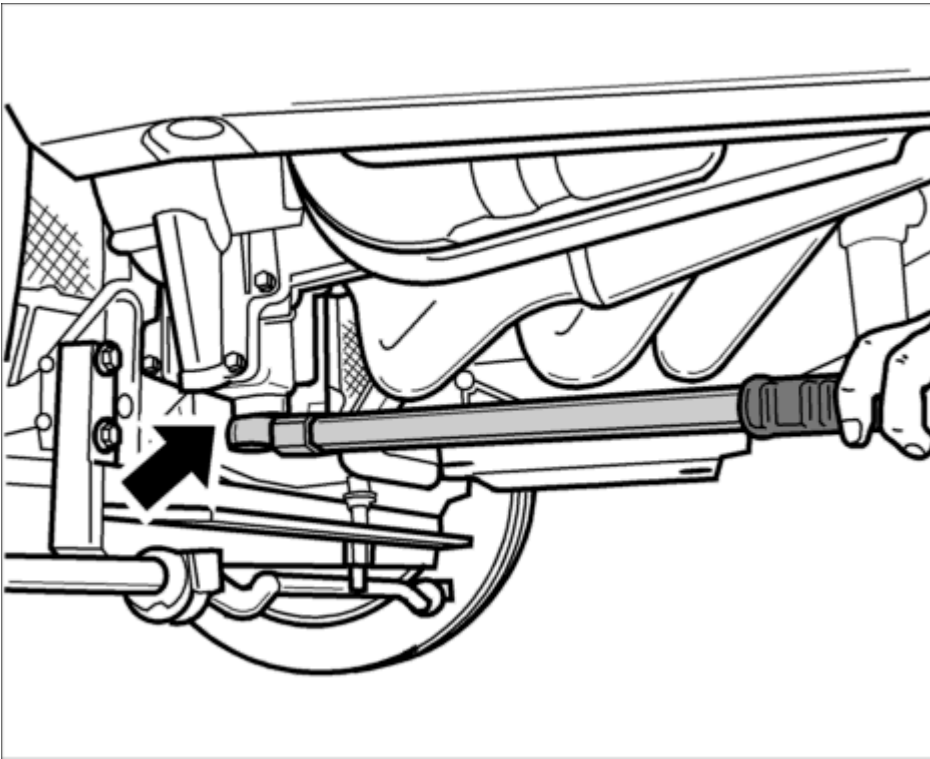


Fig. 152: Chain tensioner, cylinders 1 - 3

Courtesy of PORSCHE OF NORTH AMERICA, INC.

6. Insert chain tensioner for cylinder 1 - 3 with new sealing ring (hexagon a/f 32) and tighten to the specified torque. --> **Tightening torque: 80 (59 ftlb.) Nm**
7. Fasten coolant pipes on cylinder side 1 -3 with two M6 x 12 hexagon-head bolts. --> **Tightening torque: 10 (7.5 ftlb.) Nm**
8. Fit two new closure caps on cylinder head cover.
9. Pull locating pin out of crankshaft belt pulley.

Installing bearing cover for intermediate shaft - from engine number 62.504095

CAUTION: Risk of damage due to particles of dirt.

- **Oil bores/oil ducts can become blocked up.**

--> When working on the engine, absolute cleanliness is essential.

--> Lay removed engine parts on a clean base and cover them without fail.

--> Use the **cover for dust protection when fitting the engine NR.165** on the engine assembly support.

NOTE:

- ***The same sealing ring and installation/removal procedure applies as for the "old" bearing cover.***
- ***The new bearing cover can only be retrofitted along with the new intermediate shaft up to model year 2003.***

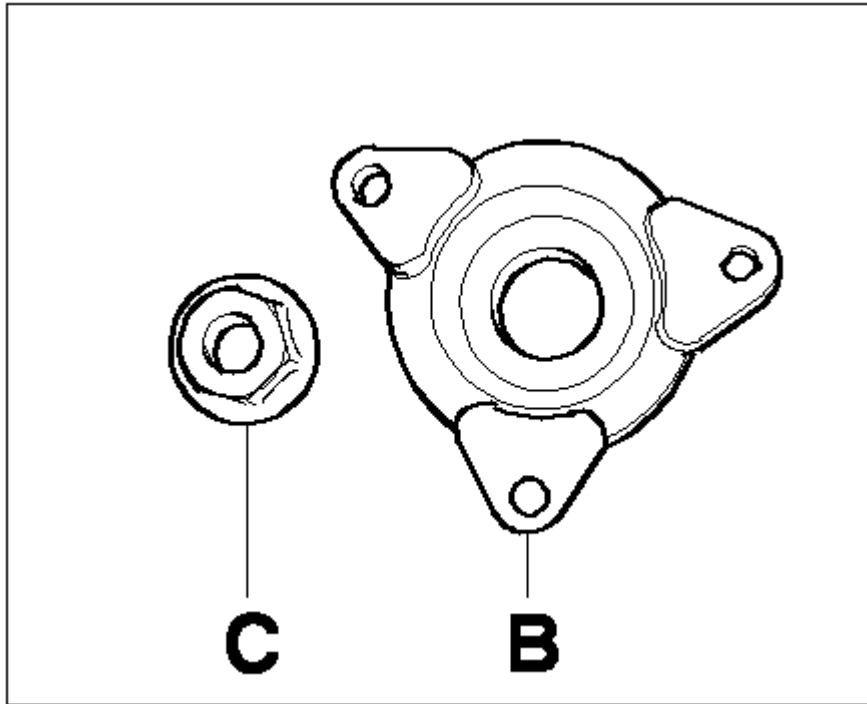


Fig. 153: New bearing cover for intermediate shaft
Courtesy of PORSCHE OF NORTH AMERICA, INC.

NOTE: Always observe specified engine number range.

New bearing cover

- B - Bearing cover 996.105.024.06
- C - Collar nut, M12 x 1.25

NOTE:

- ***Clean working area of bore for bearing cover and crankcase thoroughly using acetone or solvent naphtha.***

1. Before installing the new bearing cover, check the fitted bore (axial attachment surface, bore chamfers) on the crankcase for sharp edges and burrs. They should be removed with an oilstone or a polishing cloth. Remove any existing residue and clean the bore with a clean cloth soaked in solvent naphtha or acetone.

NOTE:

- ***Replace bearing cover or sealing ring for bearing cover --> 152355***
Replacing sealing ring for intermediate shaft.

2. Grease fitted bore in crankcase and new bearing cover (with new sealing ring) with special grease Optimoly MP3 (available from Porsche Parts Service) and place bearing cover in position.

NOTE:

- ***Replace collar nut M12 and coated M6 screws for bearing cover.***

3. Position three new, coated M6 x 20 screws on the crankcase and pull in the bearing cover by screwing in the screws uniformly. Tighten the screws. --> **Tightening torque: 10 (7.5 ftlb.) Nm**

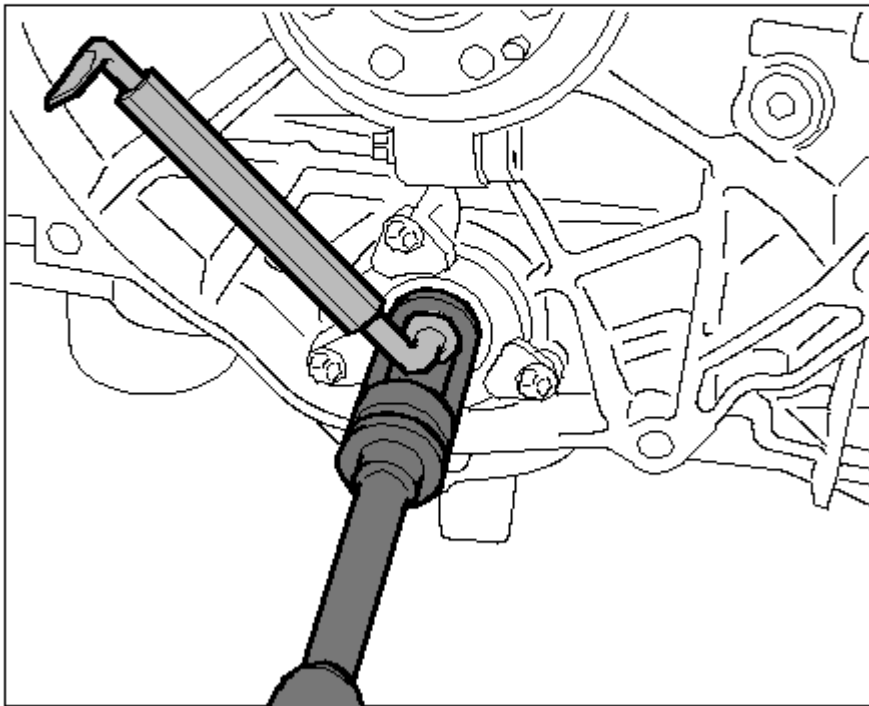


Fig. 154: Threaded joint with collar nut on bearing cover for intermediate shaft
Courtesy of PORSCHE OF NORTH AMERICA, INC.

4. Position new M12 x 1.25 collar nut on the threaded pin of the intermediate shaft. Then tighten the nut using special tool **assembly tool P 9673/1**. At the same time, counter with an angle screwdriver in the slotted threaded pin of the intermediate shaft. --> **Tightening torque : 20 (15 ftlb.) Nm +/-1 (0.5 ftlb.) Nm**

2007 Porsche Boxster

ENGINE Cylinder head, valve drive - Boxster And Cayman

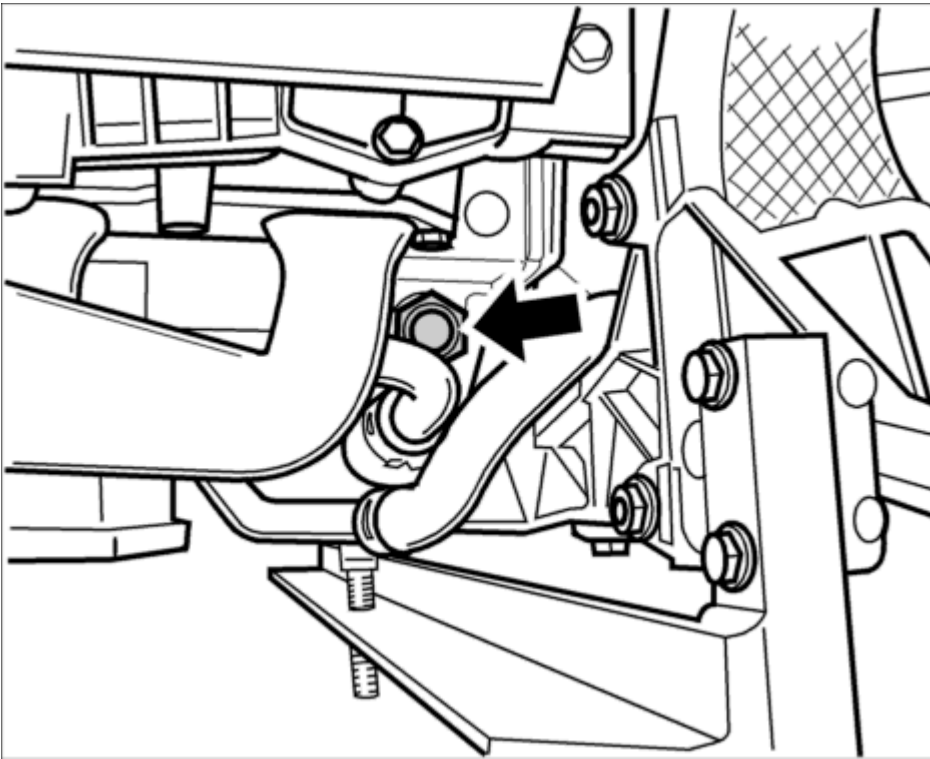


Fig. 155: Primary chain tensioner

Courtesy of PORSCHE OF NORTH AMERICA, INC.

5. Insert primary chain tensioner with new sealing ring (hexagon a/f 32) and tighten to the specified torque. -->
Tightening torque: 80 (59 ftlb.) Nm

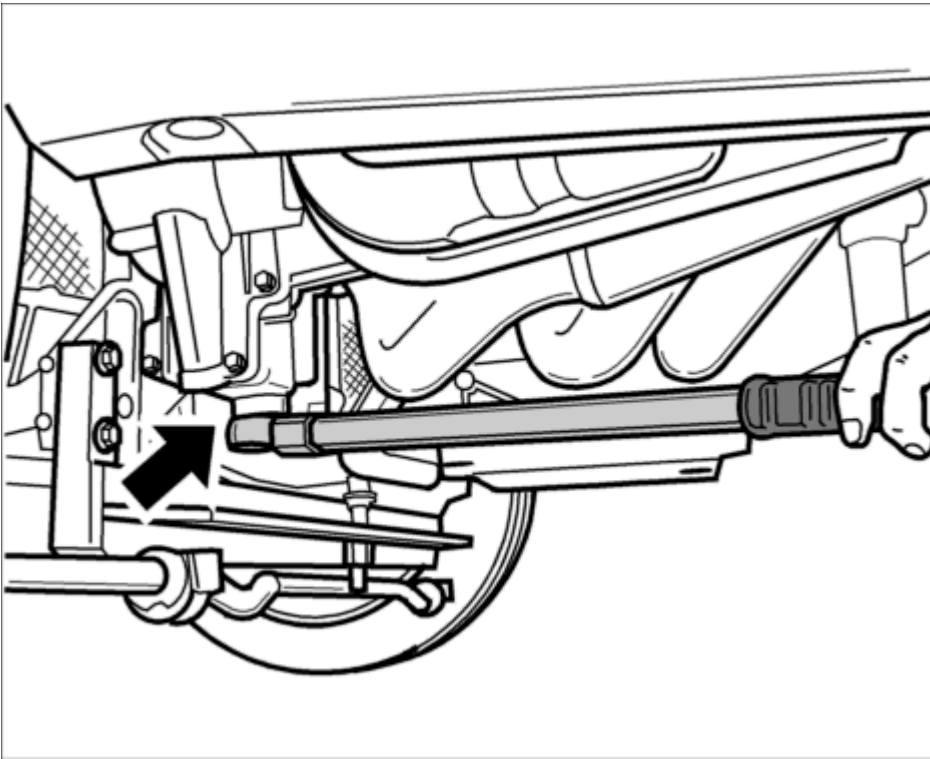


Fig. 156: Chain tensioner, cylinders 1 - 3

Courtesy of PORSCHE OF NORTH AMERICA, INC.

6. Insert chain tensioner for cylinder 1 - 3 with new sealing ring (hexagon a/f 32) and tighten to the specified torque. --> **Tightening torque: 80 (59 ftlb.) Nm**
7. Secure coolant pipe on cylinder side 1 -3 with two M6 x 12 hexagon-head bolts. --> **Tightening torque: 10 (7.5 ftlb.) Nm**
8. Fit new closure caps on cylinder head cover.
9. Pull locating pin out of crankshaft belt pulley.

SUBSEQUENT WORK FOR BEARING COVER FOR INTERMEDIATE SHAFT

Subsequent work for bearing cover for intermediate shaft

Tiptronic:

1. Install drive plate for converter. Refer to **13 63 19 Removing and installing drive plate for converter - as of MY 2005 (All Models)** .
2. Install automatic transmission. Refer to **37 35 19 Removing and installing automatic transmission - as of MY 2005 (Boxster S, Boxster S RHD)** .

Manual transmission:

2007 Porsche Boxster

ENGINE Cylinder head, valve drive - Boxster And Cayman

3. Install clutch. Refer to **30 50 19 Removing and installing clutch - as of MY 2005 (All Models)** .
4. Install double-mass flywheel. Refer to **13 60 19 Removing and installing flywheel - as of MY 2005 (All Models)** .
5. Install transmission. Refer to **34 35 19 Removing and installing transmission - as of MY 2005 (All Models)** .

All:

6. Filling in engine oil. Refer to **17 01 55 Engine oil and oil filter change - as of MY 2005 (All Models)** .

NOTE:

- ***Note the work instructions for disconnecting and reconnecting the battery.***

7. Connect the battery --> **27 06 IN WORK INSTRUCTIONS AFTER DISCONNECTING THE BATTERY - AS OF MY 2005 (ALL MODELS)** .

15 23 55 REPLACING SEALING RING FOR BEARING COVER FOR INTERMEDIATE SHAFT - AS OF MY 2005 (BOXSTER, BOXSTER RHD, BOXSTER S, BOXSTER S RHD)

PRELIMINARY WORK FOR BEARING COVER SEALING RING

Preliminary work for bearing cover sealing ring

1. Remove bearing cover for intermediate shaft --> **152119 Removing and installing bearing cover for intermediate shaft - chapter on "removing" [987320 987321]** --> **152119 Removing and installing bearing cover for intermediate shaft - chapter on "removing" [987310 987311]**.

REPLACING SEALING RING FOR BEARING COVER FOR INTERMEDIATE SHAFT

Replacing sealing ring for bearing cover for intermediate shaft

Installation position of sealing ring

2007 Porsche Boxster

ENGINE Cylinder head, valve drive - Boxster And Cayman

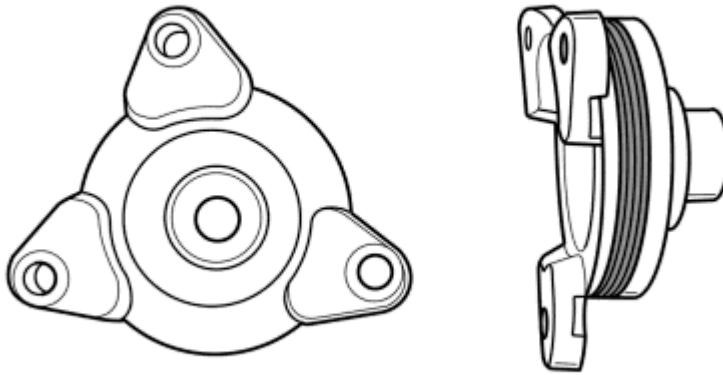


Fig. 157: Sealing ring on bearing cover

Courtesy of PORSCHE OF NORTH AMERICA, INC.

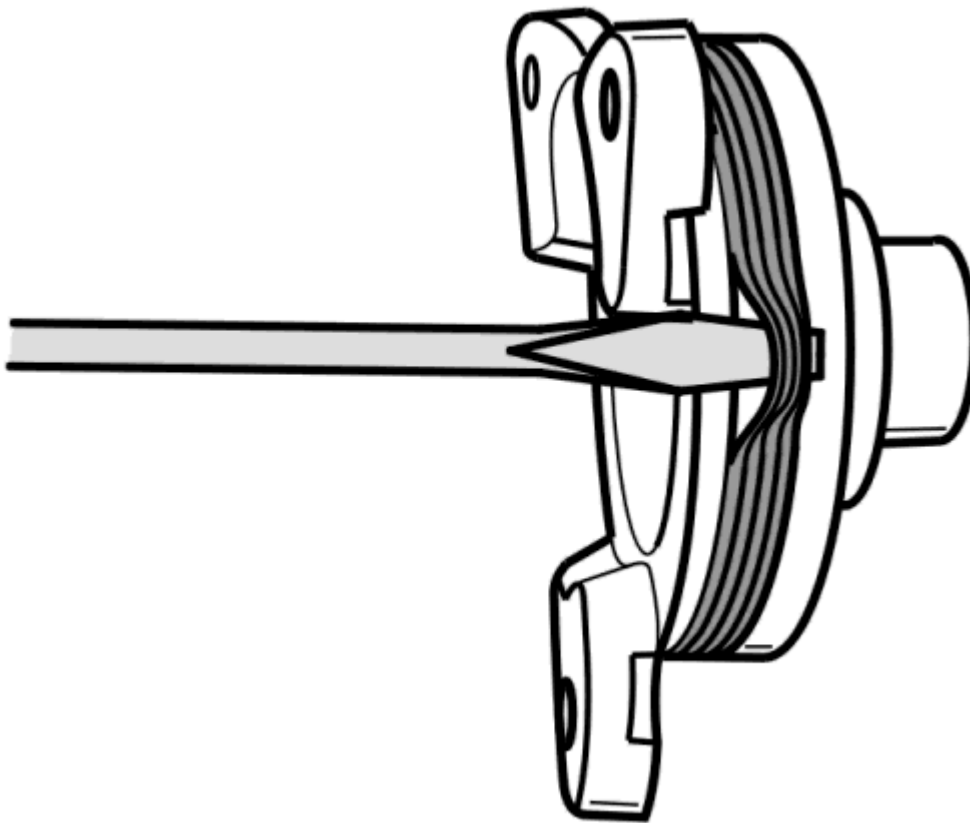


Fig. 158: Levering off sealing ring

Courtesy of PORSCHE OF NORTH AMERICA, INC.

2007 Porsche Boxster

ENGINE Cylinder head, valve drive - Boxster And Cayman

NOTE: Do not use a sharp object to lever off the sealing ring.

1. Carefully lever off sealing ring with a small piece of wood or a plastic spatula in order to avoid damaging the groove.

NOTE:

- ***Before fitting the new sealing ring, check the edges of the bearing cover for burred spots. Carefully remove these using an oilstone or polishing cloth. Clean bearing cover (without sealing ring) thoroughly using acetone or solvent naphtha.***

2. Insert new sealing ring into the groove on the bearing cover by hand. The sealing ring can be fitted in any direction since the sealing lips are facing vertically upwards and do not therefore have to be fitted in a specific direction.

3. Before installation, grease the new sealing ring on the bearing cover and the fitting bore in the crankcase with special grease Optimoly MP3 (available from Porsche Parts Service).

SUBSEQUENT WORK FOR BEARING COVER SEALING RING

Subsequent work for bearing cover sealing ring

1. Install bearing cover --> **152119 Removing and installing bearing cover for intermediate shaft - chapter on "installing" [987320 987321] --> 152119 Removing and installing bearing cover for intermediate shaft - chapter on "installing" [987310 987311].**

15 37 19 REMOVING AND INSTALLING SOLENOID HYDRAULIC VALVE (CAMSHAFT TIMING) - AS OF MY 2005 (BOXSTER, BOXSTER RHD, BOXSTER S, BOXSTER S RHD)

TOOLS

Designation	Type	Number	Explanation	
relay puller	special tool	P 9235		

REMOVING HYDRAULIC VALVE FOR CAMSHAFT TIMING

Removing hydraulic valve for camshaft timing

CAUTION: Risk of oil contamination and blocked oil bores

- **Faulty engine parts, engine damage**

--> Absolute cleanliness is essential when working on hydraulic valves.

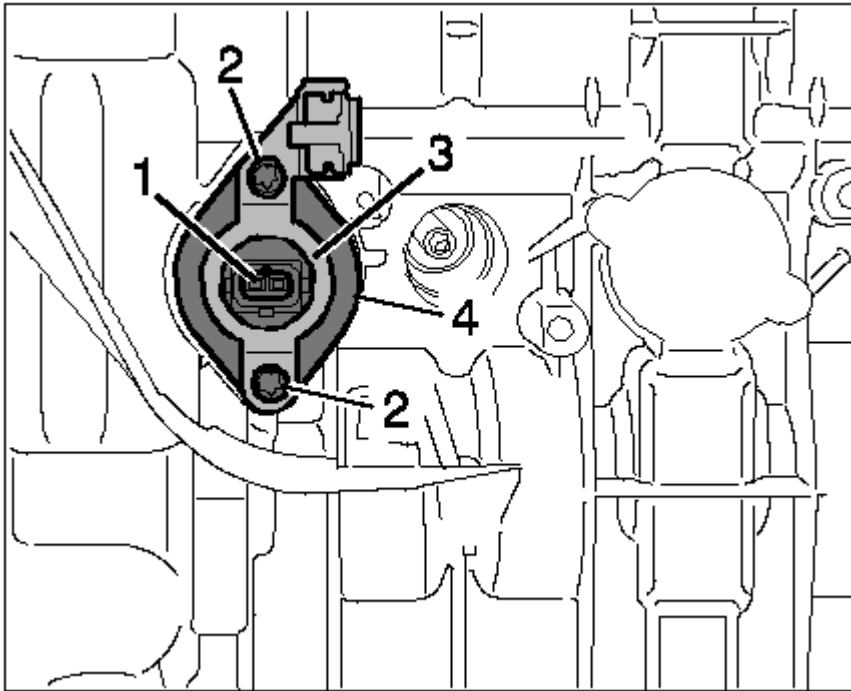


Fig. 159: Solenoid hydraulic valve for camshaft timing

Courtesy of PORSCHE OF NORTH AMERICA, INC.

1. Disconnect cable plug on hydraulic valve -1- by pressing the clip and pulling off the cable plug. See **Fig. 159**.
2. Unscrew two M6 x 20 inner Torx screws -2- at the valve holder and remove the holder along with the screws. See **Fig. 159**.

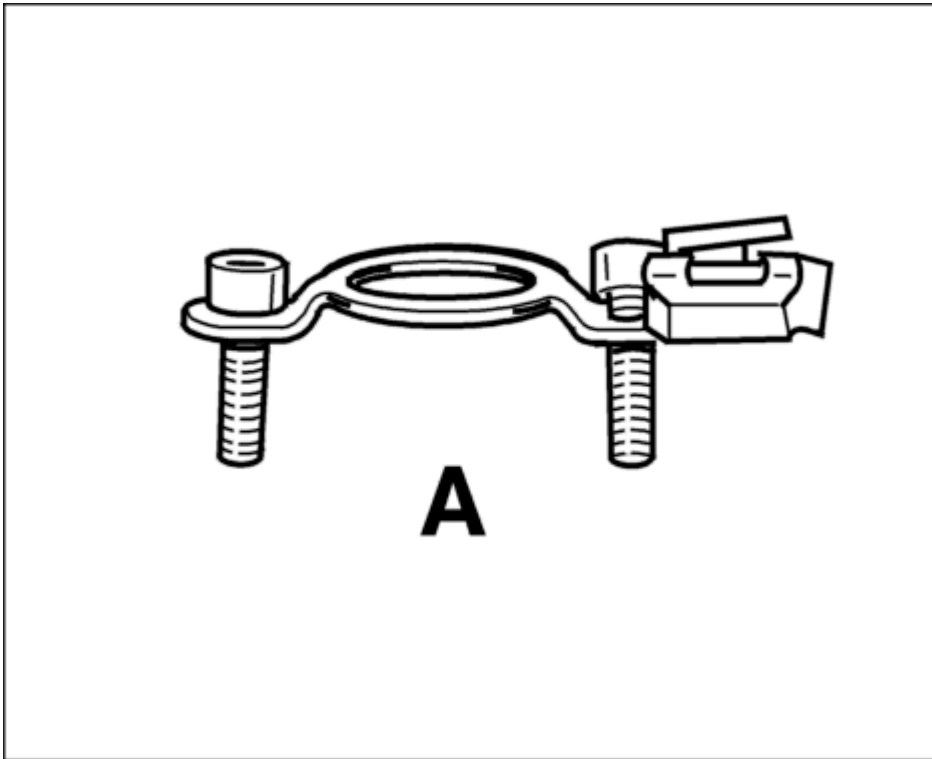


Fig. 160: Holder for solenoid hydraulic valve for camshaft timing
Courtesy of PORSCHE OF NORTH AMERICA, INC.

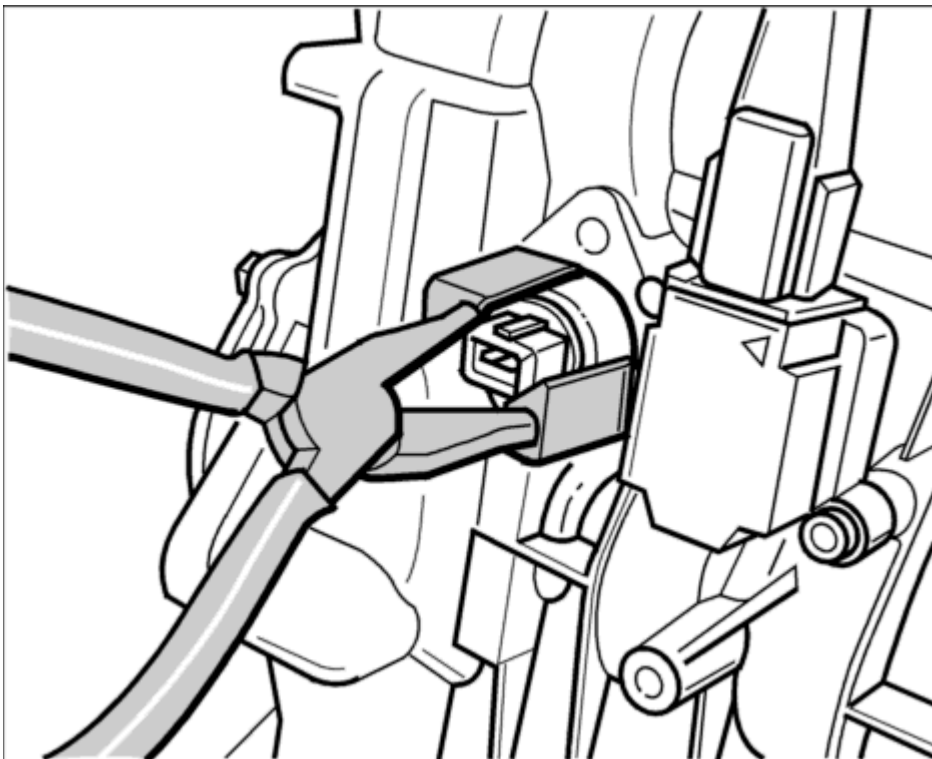


Fig. 161: Pulling out hydraulic valve with relay puller
Courtesy of PORSCHE OF NORTH AMERICA, INC.

NOTE:

- ***Handle the hydraulic valve with care; do not turn it at the valve tip or at the safety contact.***
- ***A seal against leaks cannot be ensured if there is damage in the area of the retainer plate, therefore handle the pliers indicated with care.***

3. Carefully pull the hydraulic valve out of the cylinder head using special tool relay puller P 9235. Before using the puller, mask the valve body in fabric tape in order to prevent slippage or damage.

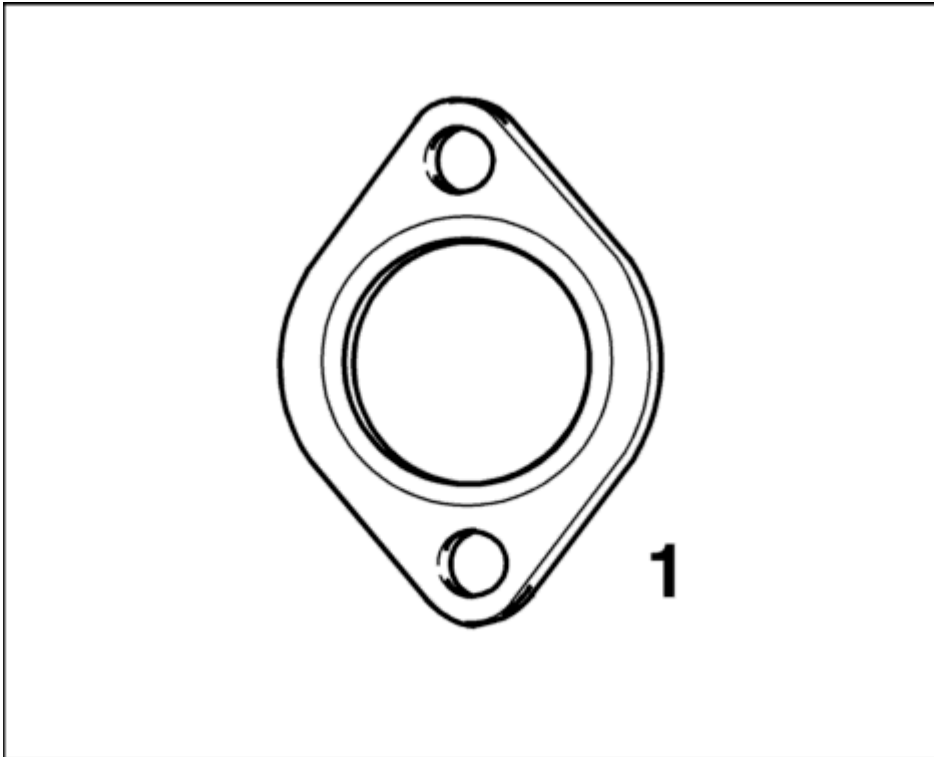


Fig. 162: Installation position of retainer plate for solenoid hydraulic valve for camshaft timing
Courtesy of PORSCHE OF NORTH AMERICA, INC.

4. Remove retainer plate with integrated seal -1- from the valve. See Fig. 162.

NOTE:

- ***Handle the hydraulic valve with care; do not turn it at the valve tip or at the safety contact.***
- ***A seal against leaks cannot be ensured if there is damage in the area of the retainer plate, therefore handle the pliers indicated with care.***

5. Check the valve body for damage in the sealing area of the retainer plates. If necessary, the valve must be replaced.

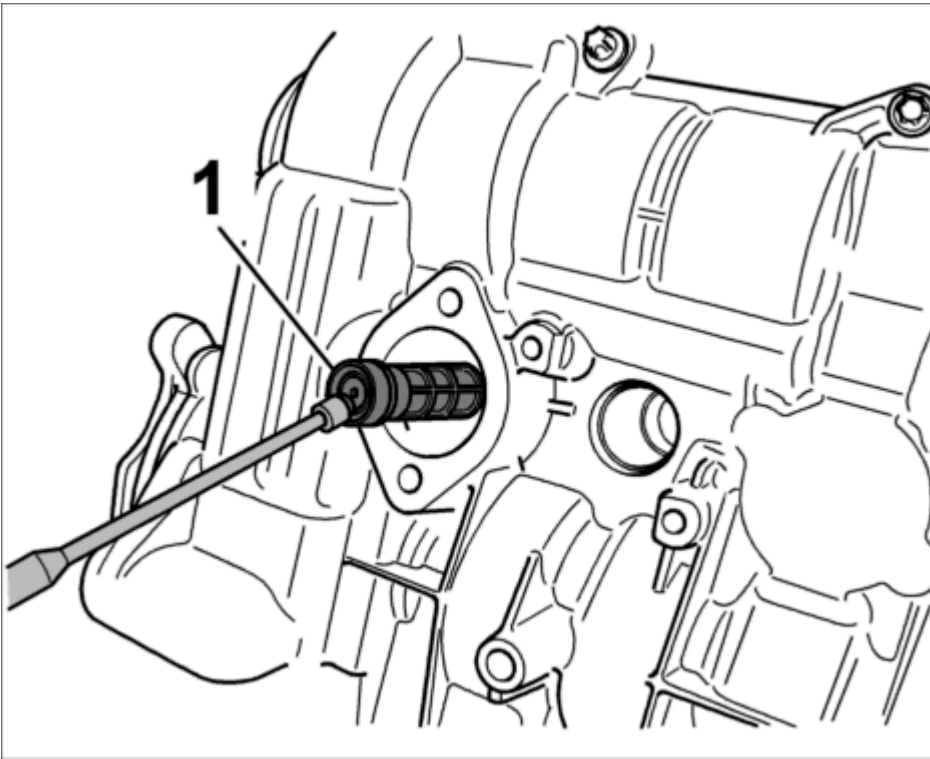


Fig. 163: Oil strainer hydraulic valve NVS

Courtesy of PORSCHE OF NORTH AMERICA, INC.

6. Pull the oil strainer -1- out of the cylinder head bore using a bar magnet. Clean using solvent naphtha, check for damage and soiling, and replace if necessary. Pay attention to the installation position. See **Fig. 163**.

INSTALLING HYDRAULIC VALVE FOR CAMSHAFT TIMING

Installing hydraulic valve for camshaft timing

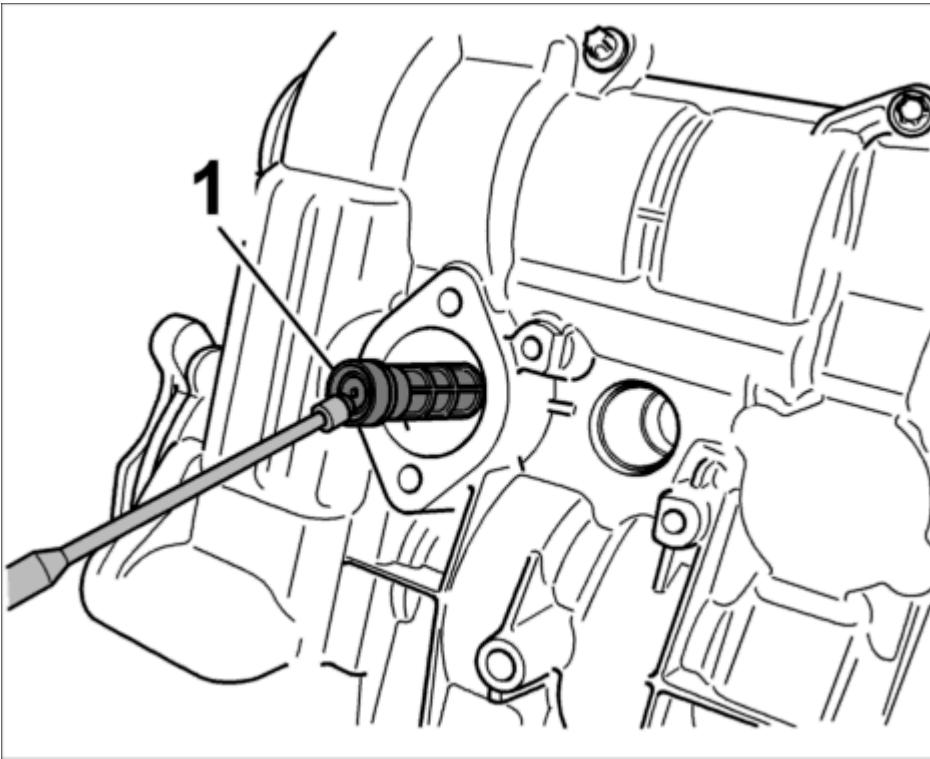


Fig. 164: Oil strainer hydraulic valve NVS

Courtesy of PORSCHE OF NORTH AMERICA, INC.

1. Using a bar magnet, fit a cleaned or new oil strainer into the cylinder bore -1- . Pay attention to the installation position. See **Fig. 164**.

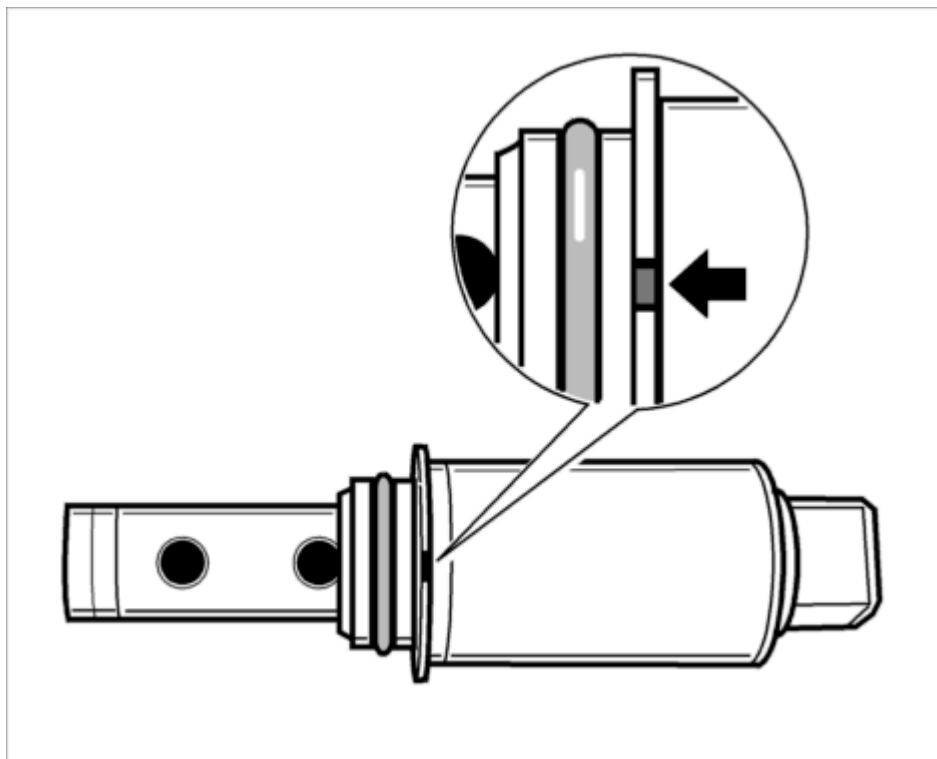


Fig. 165: Groove on valve for camshaft timing

Courtesy of PORSCHE OF NORTH AMERICA, INC.

NOTE:

- *Replace O-ring on hydraulic valve and retainer plate with seal.*
- *Observe installation position of the hydraulic valve.*

2. Replace O-ring on the hydraulic valve and coat new O-ring with engine oil. Insert hydraulic valve into the cylinder head. Pay attention to installation position while doing this. The groove on the valve **-arrow-** points to the dowel pin in the cylinder head. See **Fig. 165**.

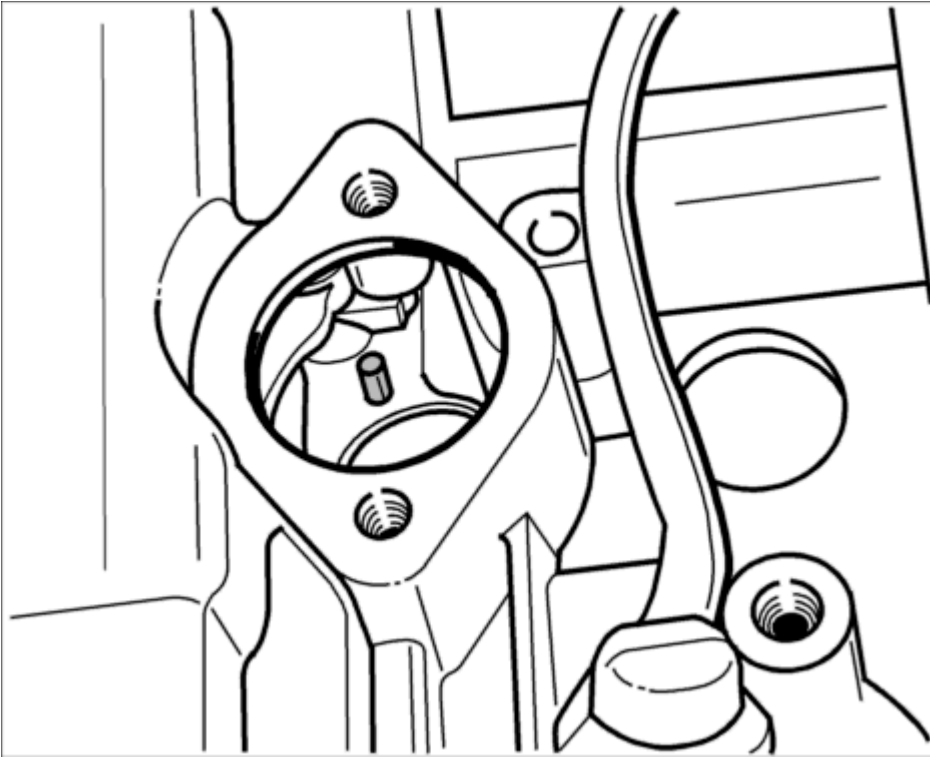


Fig. 166: Dowel pin for valve for camshaft timing
Courtesy of PORSCHE OF NORTH AMERICA, INC.

Position of dowel pin in cylinder head

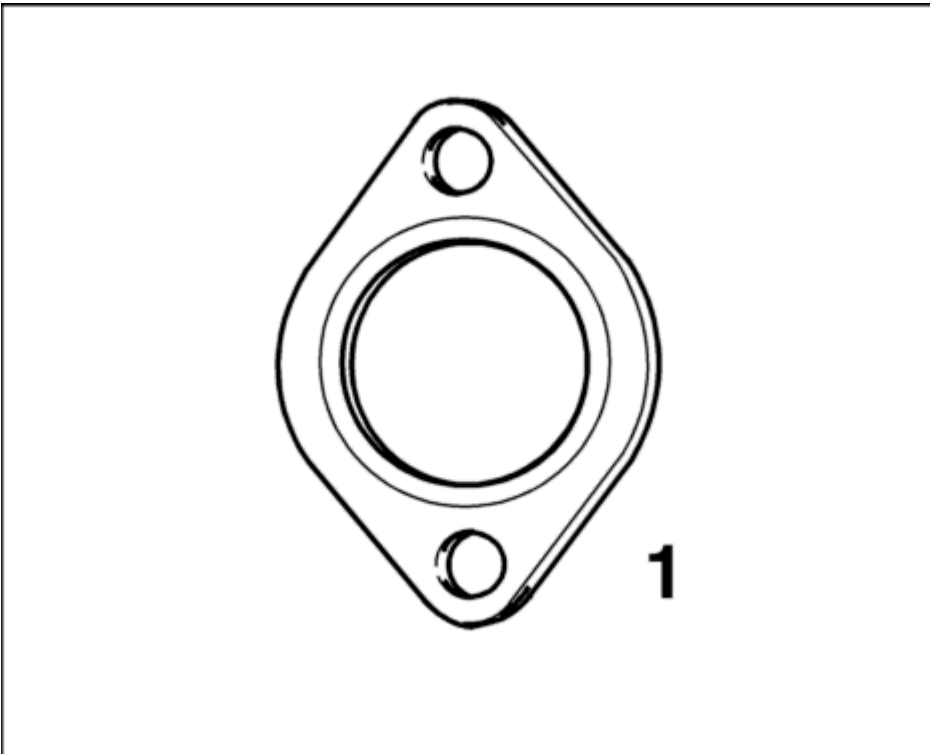


Fig. 167: Installation position of retainer plate for solenoid hydraulic valve for camshaft timing
 Courtesy of PORSCHE OF NORTH AMERICA, INC.

3. Lightly coat seal of retainer plate with engine oil and slide it over the hydraulic valve.

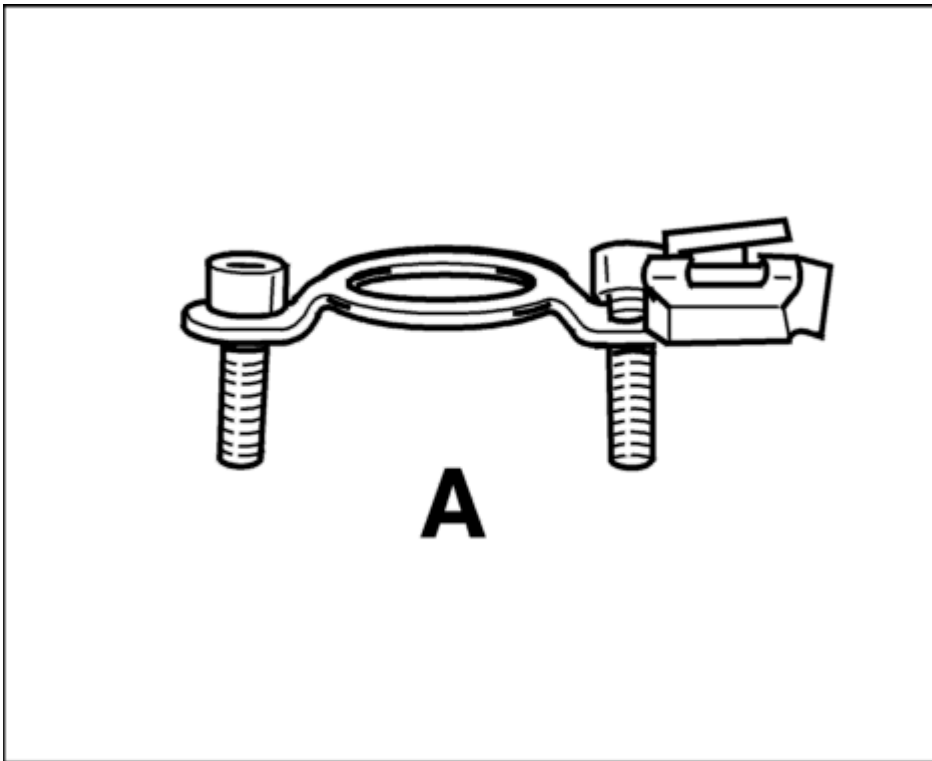


Fig. 168: Holder for solenoid hydraulic valve for camshaft timing
 Courtesy of PORSCHE OF NORTH AMERICA, INC.

4. Position two M6 x 20 inner Torx screws complete with holder -A- on the valve and tighten the screws. Observe installation position of the cable terminal (to intake distributor). --> **Tightening torque: 7.5 ftlb.** . See **Fig. 168.**

5. Push cable plug onto the hydraulic valve. Make sure that the plug engages audibly.

15 70 19 REMOVING AND INSTALLING CYLINDER HEAD - AS OF MY 2005 (BOXSTER, BOXSTER RHD, BOXSTER S, BOXSTER S RHD)

TOOLS

Designation	Type	Number	Explanation	
cover for dust protection when fitting the engine	special tool	NR.165		

PRELIMINARY WORK FOR REMOVING CYLINDER HEAD

Preliminary work for removing cylinder head

1. Remove exhaust manifold. Remove old seal.
2. Remove cylinder head cover --> **158220 Removing and installing cylinder head cover - chapter on "Removing"**.
3. Remove camshafts --> **150520 Removing and installing camshaft - section on "Removing" [987320 987321]** --> **150520 Removing and installing camshaft - section on "Removing" [987310 987311]**.

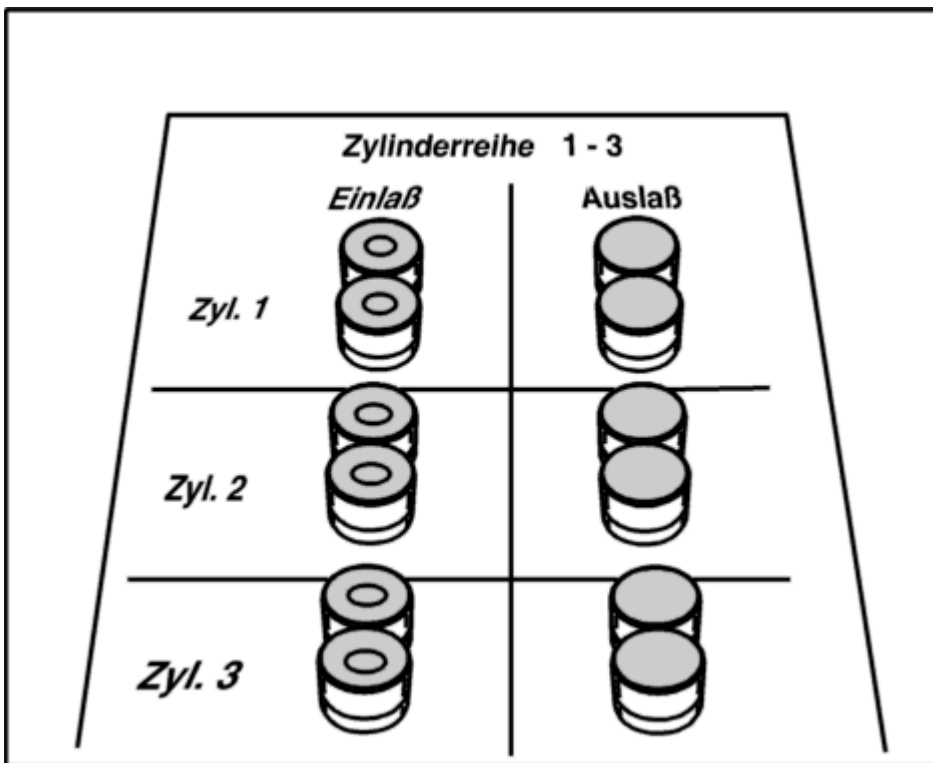


Fig. 169: Example of laying aside flat-base tappets
 Courtesy of PORSCHE OF NORTH AMERICA, INC.

CAUTION: Interchanged or dirty flat-base tappets.

- **Damage to engine components**

--> The components have been run in the fitting bores in the housing, therefore do not interchange them.

--> Pay attention to cleanliness.

NOTE: There must be no visible signs of wear on the flat-base tappets and fitting bores of the flat-base tappet housing.

4. Remove the flat-based tappets. Pull each of the components out of the flat-base tappet housing using a strong

magnet. Check running surfaces for signs of damage. To avoid confusing the individual flat-based tappets, lay them on a labelled, clean surface --> *Example of laying aside flat-base tappets* and cover them. See **Fig. 169**.

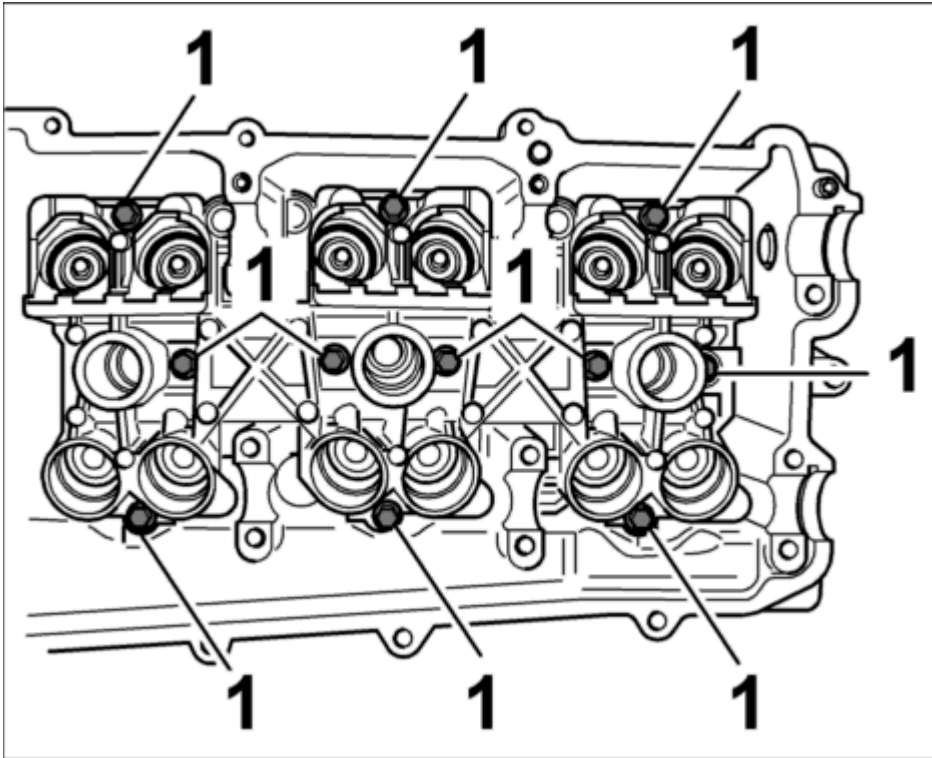


Fig. 170: Flat-base tappet housing bolts

Courtesy of PORSCHE OF NORTH AMERICA, INC.

5. Remove flat-base tappet housing. Unscrew 11 Torx screws -1- from the outside to the inside. Remove housing and check the fitting bores for damage. See **Fig. 170**.

6. Remove the old O-rings at the spark-plug recesses.

REMOVING CYLINDER HEAD

Removing cylinder head

CAUTION: Risk of damage due to particles of dirt.

- Oil bores/oil ducts can become blocked up.

--> When working on the engine, absolute cleanliness is essential.

--> Lay removed engine parts on a clean base and cover them without fail.

--> Use the cover for dust protection when fitting the engine NR.165 on the engine assembly support.

Cylinder head 1-3:

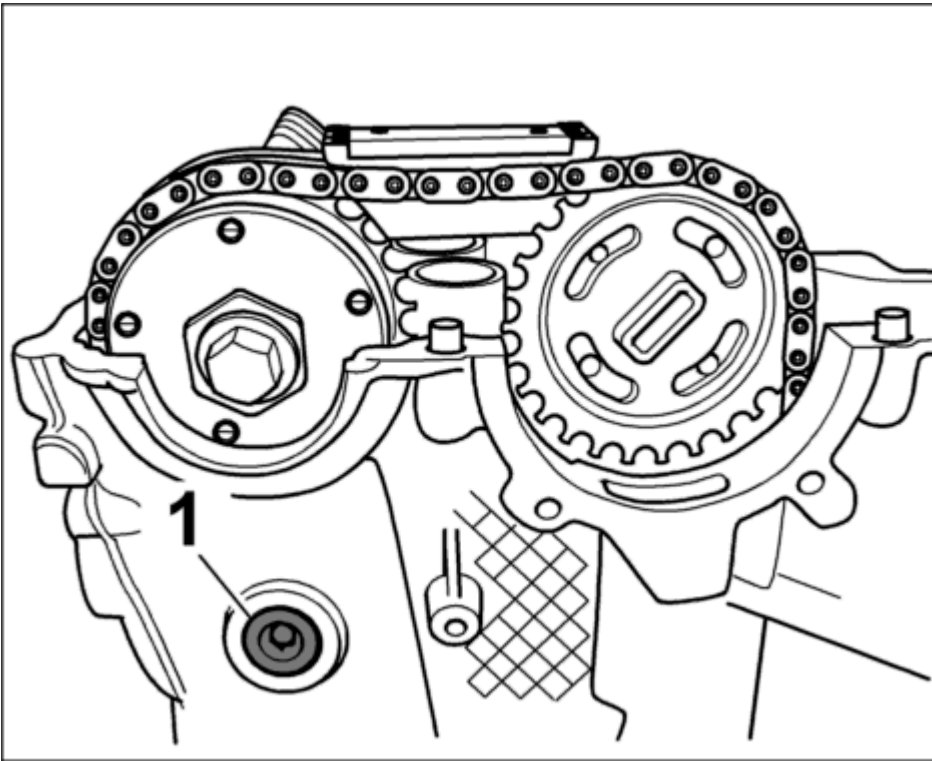


Fig. 171: Guide rail screw for cylinders 1-3

Courtesy of PORSCHE OF NORTH AMERICA, INC.

1. Unscrew M6 threaded bolt (hexagon socket) for guide rail (flywheel side) -1- . See **Fig. 171**.
2. Unscrew four Torx screws with M6 x 30 captive washers (10.9) -1-4- at the chain slot. Use of a magnetic bit is recommended so that the screw to be fitted in the slot -Item 4- cannot fall into the crankcase. See **Fig. 172**.

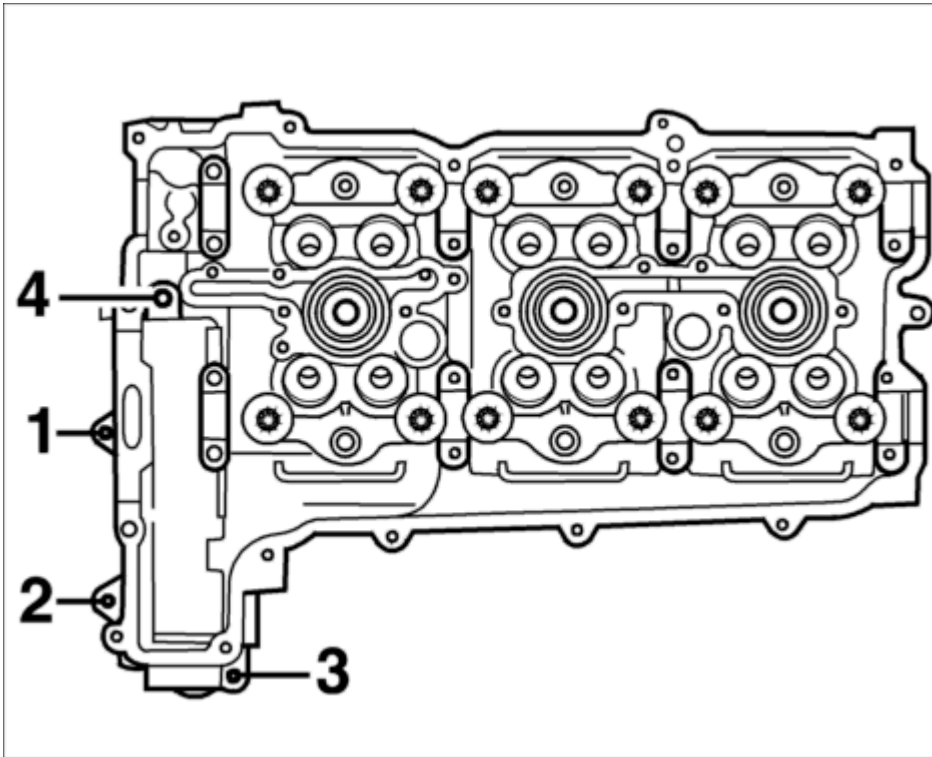


Fig. 172: External cylinder head screwed connection
Courtesy of PORSCHE OF NORTH AMERICA, INC.

3. Loosen and unscrew 12 M10 Torx cylinder-head screws from outside to inside.
4. Carefully lift off the cylinder head and remove the old cylinder-head gasket.
5. Carefully clean the sealing faces on the cylinder head and crankcase (e. g. using a nylon brush and a clean, lint-free cloth soaked in acetone). Check the sealing face from cylinder head to crankcase for damage and cracks, and rework the flat surface if necessary.

The removal of cylinder head 4-6 is the same as for side 1-3 with the following change

- The threaded bolt for guide rail 4-6 on the cylinder head (belt pulley side) -1- is removed even before the camshaft timing gears are removed. See **Fig. 173**.

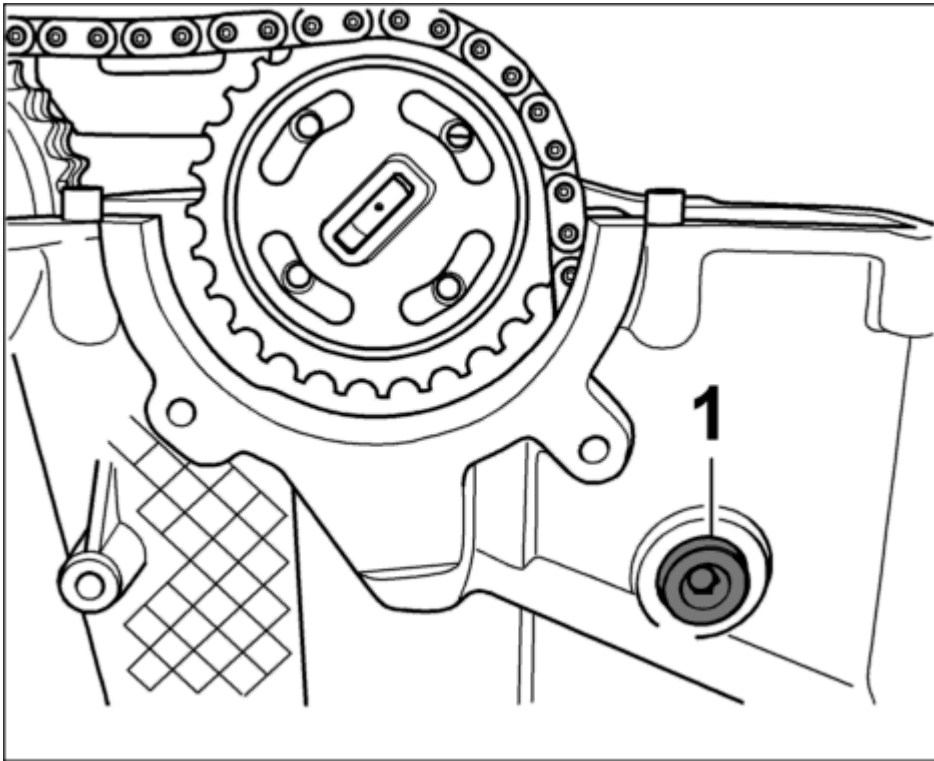


Fig. 173: Guide rail screw for cylinders 4-6
Courtesy of PORSCHE OF NORTH AMERICA, INC.

INSTALLING CYLINDER HEAD

Installing cylinder head

CAUTION: Risk of damage due to particles of dirt.

- Oil bores/oil ducts can become blocked up.

--> When working on the engine, absolute cleanliness is essential.

--> Lay removed engine parts on a clean base and cover them without fail.

--> Use the cover for dust protection when fitting the engine NR.165 on the engine assembly support.

Fitting cylinder head side 1 - 3:

1. Turn the crankcase at the assembly support in such a way that side 1-3 stands vertically upwards.
2. Fit new cylinder head gasket. The marking '**OBEN/TOP**' must be clearly visible.
3. Carefully position the cylinder head on the crankcase. Pay attention to the dowel sleeves.
4. Screw in 12 M10 Torx screws evenly and tighten according to the prescribed tightening sequence **-1-12-** . -->

2007 Porsche Boxster

ENGINE Cylinder head, valve drive - Boxster And Cayman

Initial tightening: 30 (22 ftlb.) Nm , loosen all screws in reverse tightening sequence; --> **Initial tightening: 20 (15 ftlb.) Nm** ; --> **Final tightening, 2 x torque angle: 70 °** . See **Fig. 174**.

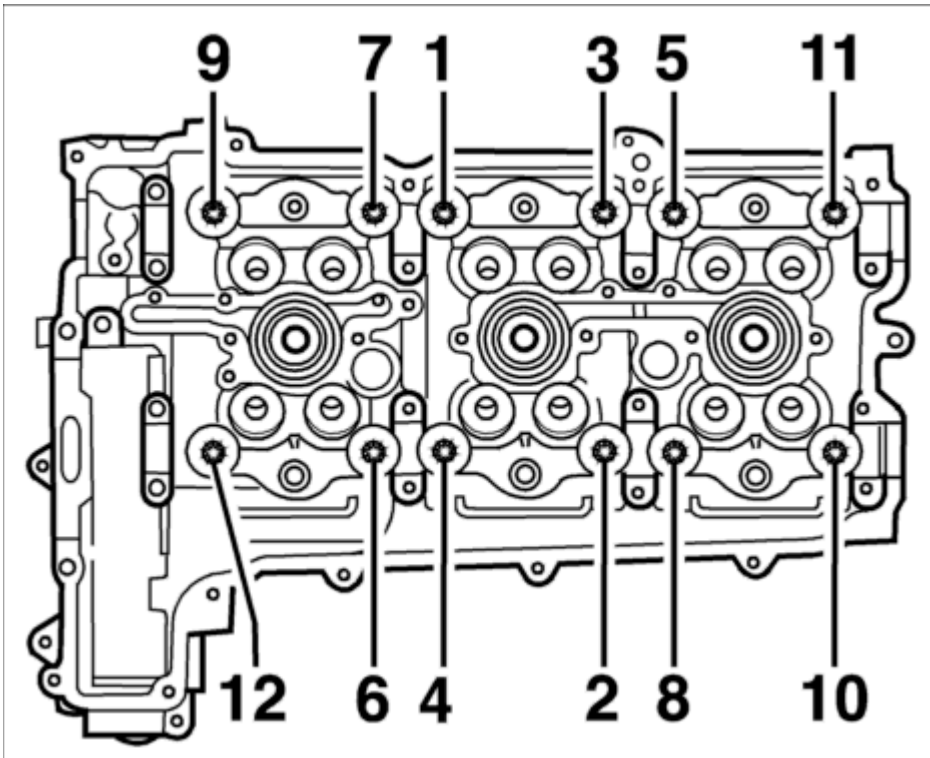


Fig. 174: Tightening sequence for cylinder-head screws
Courtesy of PORSCHE OF NORTH AMERICA, INC.

5. Screw in and tighten four Torx screws with M6 x 30 captive washers (10.9) **-1-4-** at the chain slot. Use of a magnetic bit is recommended so that the screw to be fitted in the slot **-Item 4-** cannot fall into the crankcase. --> **Tightening torque: 13 (9.5 ftlb.) Nm** . See **Fig. 175**.

2007 Porsche Boxster

ENGINE Cylinder head, valve drive - Boxster And Cayman

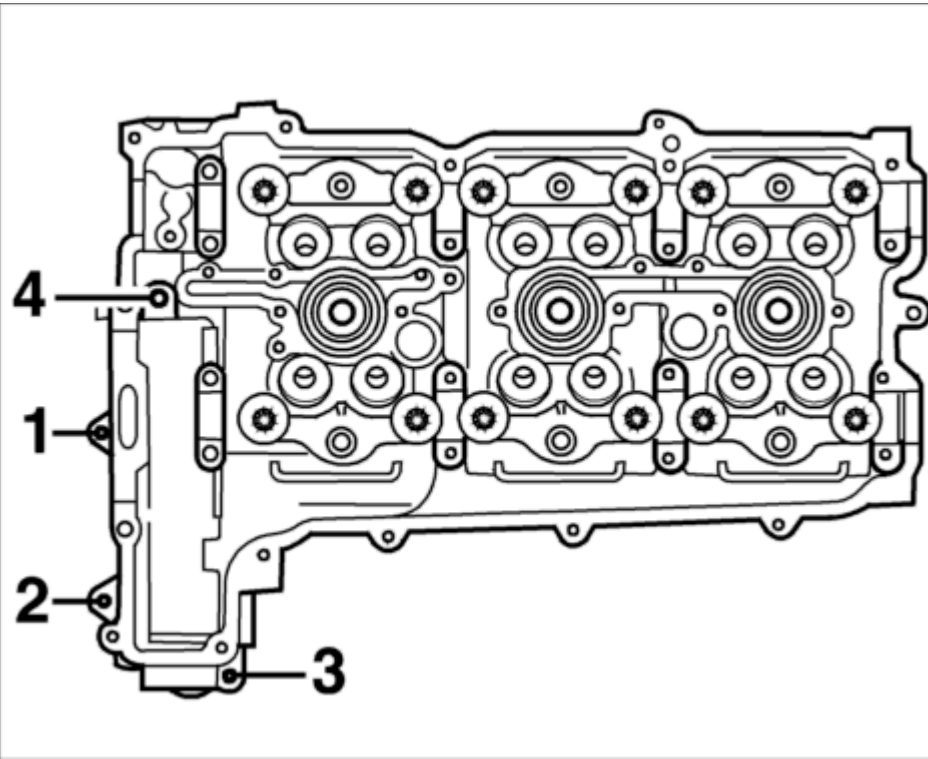


Fig. 175: External cylinder head screwed connection
Courtesy of PORSCHE OF NORTH AMERICA, INC.

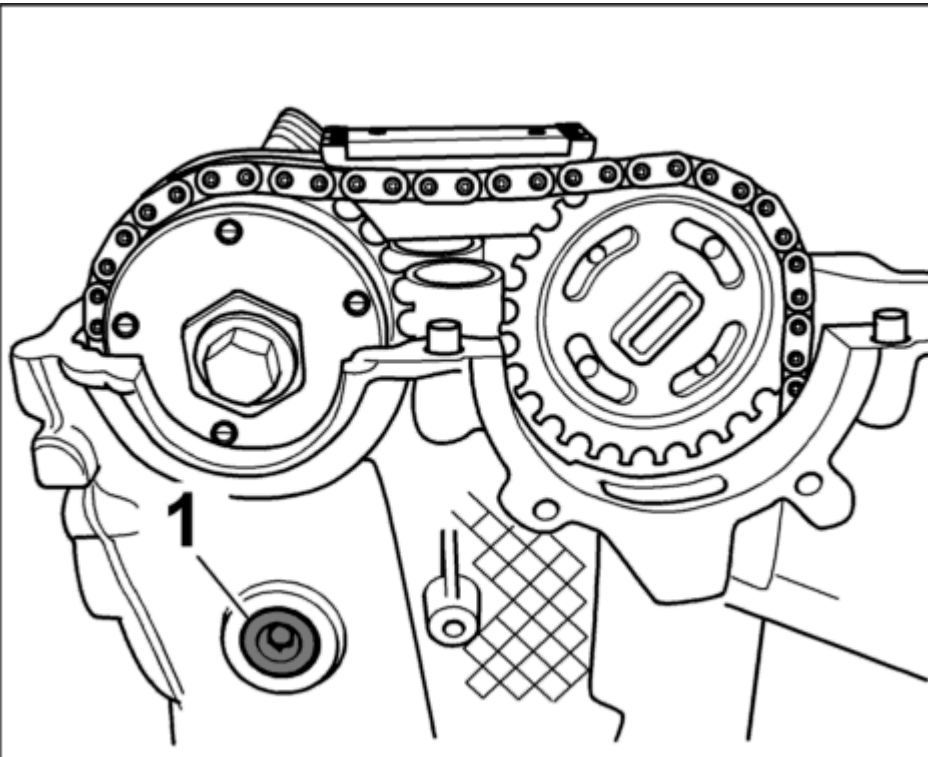


Fig. 176: Guide rail screw for cylinders 1-3
Courtesy of PORSCHE OF NORTH AMERICA, INC.

6. Fit threaded bolt for guide rail -1- with a new O-ring at the cylinder head. --> **Tightening torque: 10 (7.5 ftlb.) Nm** . See **Fig. 176**.

The installation of cylinder head side 4 -6 is carried out in the same way as the assembly sequence for side 1-3 with the following change:

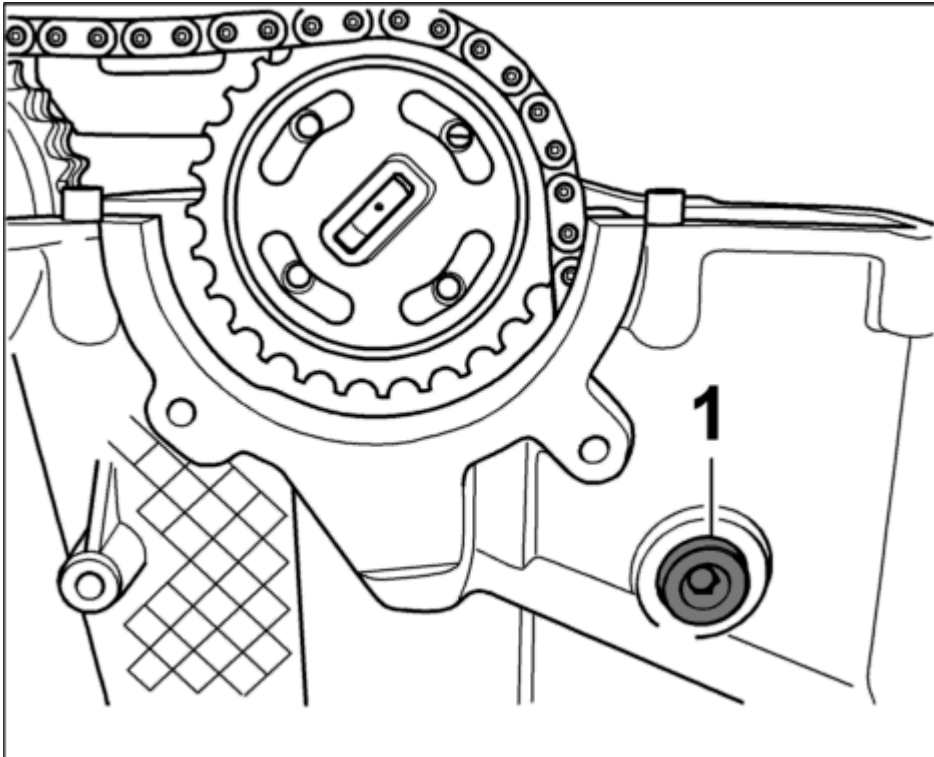


Fig. 177: Guide rail screw for cylinders 4-6

Courtesy of PORSCHE OF NORTH AMERICA, INC.

- The threaded bolt for guide rail 4-6 on the cylinder head (belt pulley side) -1- is inserted only after the timing chain has been fitted on the camshaft timing gears. See **Fig. 177**.

SUBSEQUENT WORK FOR INSTALLING CYLINDER HEAD

Subsequent work for installing cylinder head

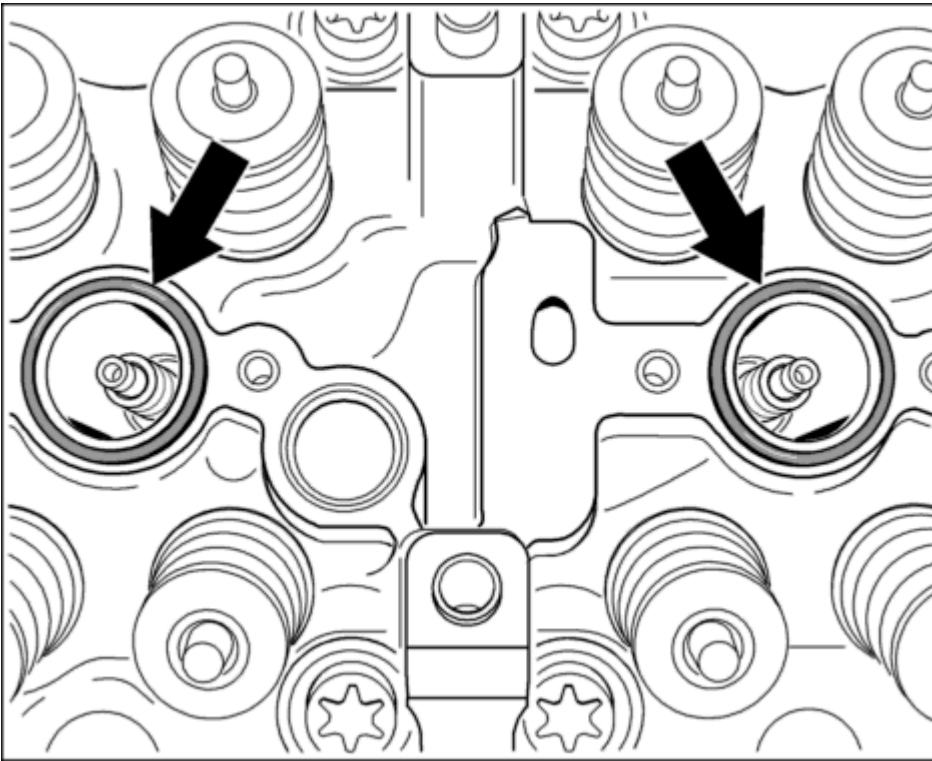


Fig. 178: O-rings on spark-plug recess seal
Courtesy of PORSCHE OF NORTH AMERICA, INC.

1. Insert three new O-rings at the spark-plug recesses -**Arrows**- , lightly coat with high-pressure grease.

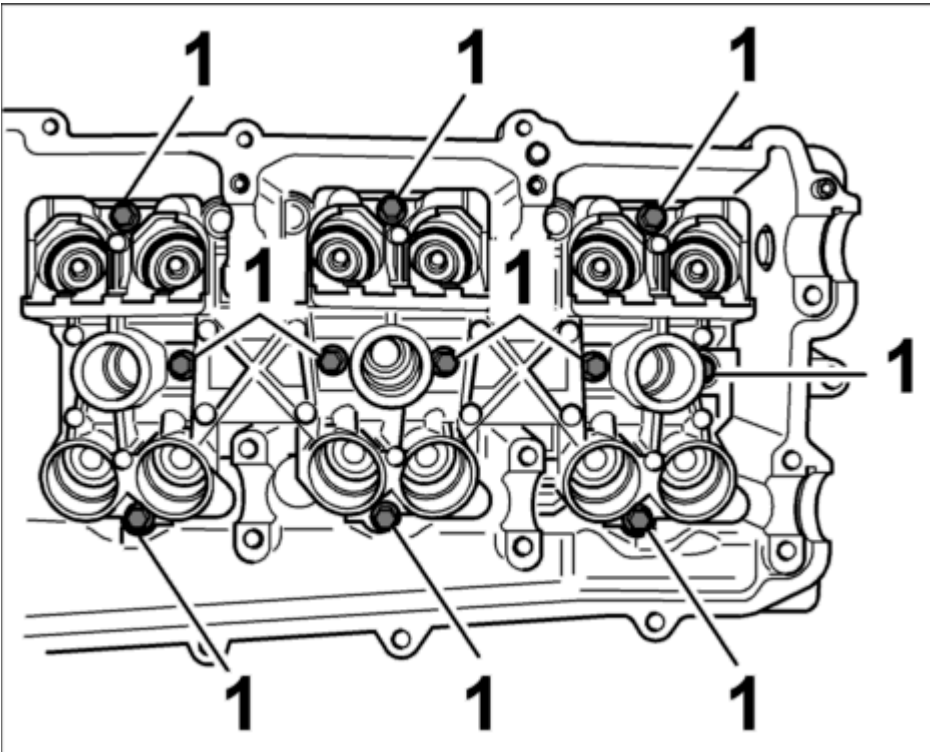


Fig. 179: Flat-base tappet housing bolts

Courtesy of PORSCHE OF NORTH AMERICA, INC.

NOTE: There must be no visible signs of wear on the flat-base tappets and fitting bores of the flat-base tappet housing.

2. Fit flat-base tappet housing with 11 M6 x 35 Torx screws -1- and tighten screws from the inside out. --> **Tightening torque: 10 (7.5 ftlb.) Nm** . See **Fig. 179**.

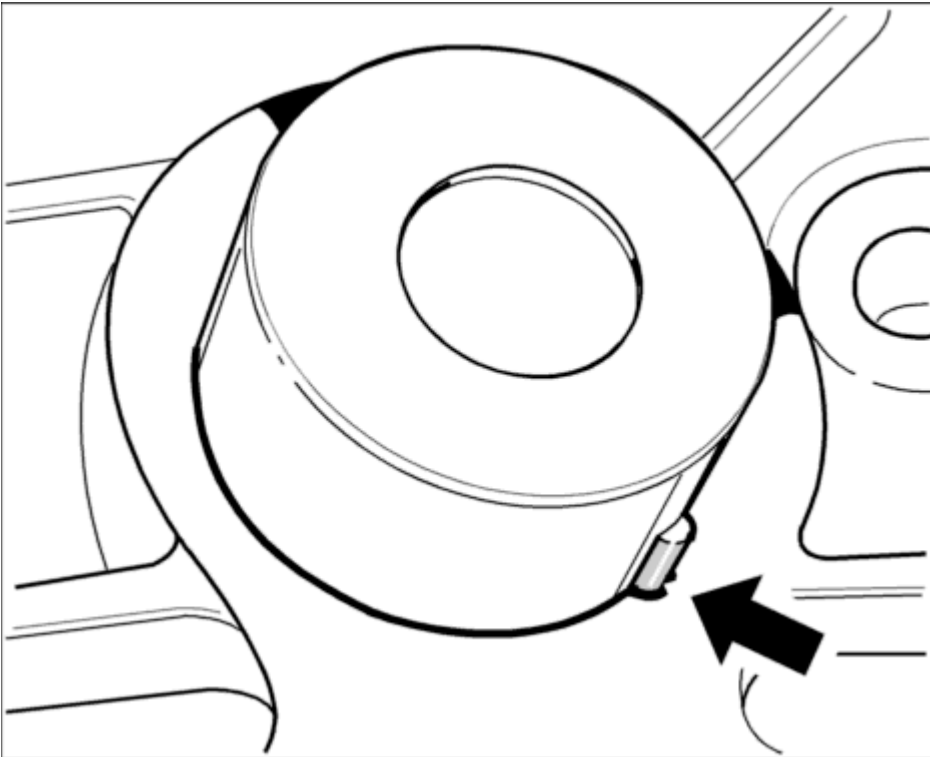


Fig. 180: Operating plunger position

Courtesy of PORSCHE OF NORTH AMERICA, INC.

CAUTION: Interchanged or dirty flat-base tappets.

- **Damage to engine components**

--> The components have been run in the fitting bores in the housing, therefore do not interchange them.

--> Pay attention to cleanliness.

3. Coat the flat-base tappets with new engine oil and insert them in their original position into the fitting bores in the flat-base tappet housing. The operating plunger position (inlet side) is pre-set by the dowel pin -**Arrow**- .

4. Install camshaft and set timing --> **150520 Removing and installing camshafts - section on "Installing" [987320 987321]** --> **150520 Removing and installing camshafts - section on "Installing" [987310 987311]**.

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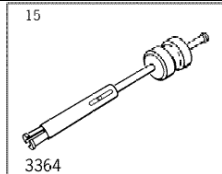

ENGINE Cylinder head, valve drive - Boxster And Cayman

5. Install cylinder head cover --> **158220 Removing and installing cylinder head cover - chapter on "Installing"**.

6. Fit exhaust manifold with new screws M8 x 26. Position new metal seal with the seam towards the cylinder head. Tighten screws from the inside out --> **Tightening torque: 23 (17 ftlb.) Nm** .

15 70 37 DISASSEMBLING AND ASSEMBLING CYLINDER HEAD - AS OF MY 2005 (ALL MODELS)

TOOLS

Designation	Type	Number	Explanation	
puller	VW-tool	3364		
cover for dust protection when fitting the engine	special tool	NR.165		
Valve keys assembly-disassembly tool for Boxster + Carrera	commercially available tool	NR.54		
assembly driver	special tool	P 9606		

PRELIMINARY WORK FOR DISASSEMBLING CYLINDER HEAD

Preliminary work for disassembling cylinder head

1. Remove engine. Refer to **10 01 19 Removing and installing engine - as of MY 2005 (Boxster, Boxster RHD, Boxster S, Boxster S RHD)** . Refer to **10 01 19 Removing and installing engine - as of MY 2005 (Cayman S, Cayman S RHD)** .

2. Remove transmission. Refer to **34 35 27 Removing and refitting transmission - as of MY 2005 (Boxster, Boxster RHD)** . Refer to **34 35 27 Removing and refitting transmission - as of MY 2005 (Boxster S, Boxster S RHD, Cayman S, Cayman S RHD)** . or. Refer to **37 35 27 Removing and refitting the automatic transmission - as of MY 2005 (All Models)** .

3. Remove cylinder head --> **157019 Removing and installing cylinder head - chapter on "Removing" [987310 987311 987320 987321]**.

DISASSEMBLING CYLINDER HEAD

Disassembling cylinder head

2007 Porsche Boxster

ENGINE Cylinder head, valve drive - Boxster And Cayman

CAUTION: Risk of damage due to particles of dirt.

- Oil bores/oil ducts can become blocked up.

--> When working on the engine, absolute cleanliness is essential.

--> Lay removed engine parts on a clean base and cover them without fail.

--> Use the **cover for dust protection when fitting the engine NR.165** on the engine assembly support.

The following tool is used and recommended for the described work: commercially available tool **Valve keys assembly- disassembly tool for Boxster + Carrera NR.54** (Sauer Co., Art. No. for standard case 600 50 00).

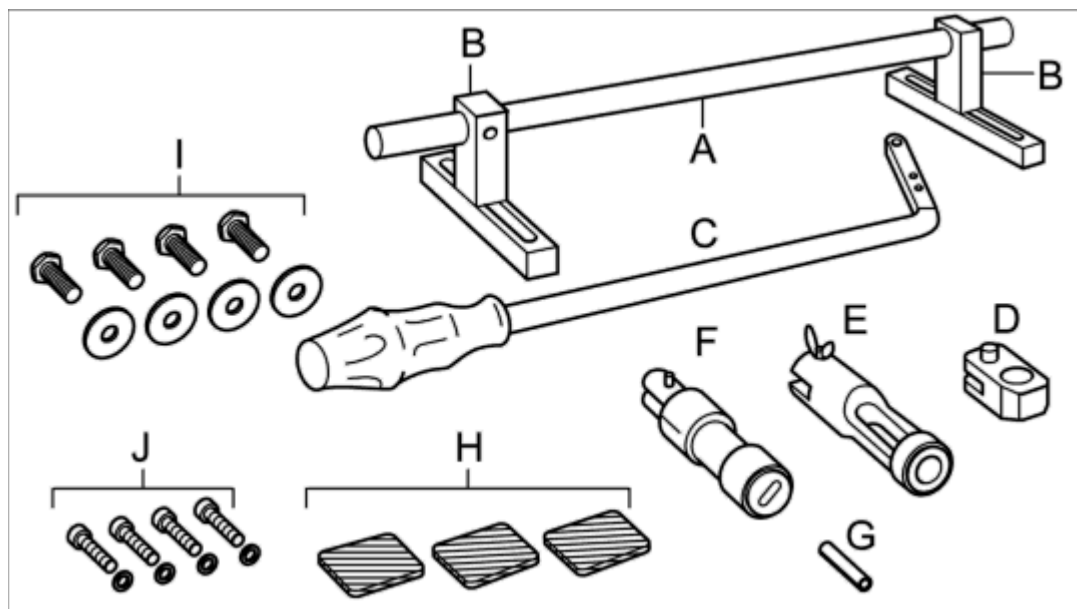


Fig. 181: Disassembling and assembling cylinder head tools
Courtesy of PORSCHE OF NORTH AMERICA, INC.

Item	Designation	Explanation
A	Shaft (ø 20 x 450 mm)	Art. No. 602 45 15
B	aluminum supports, slotted, 2-piece	Art. No. 602 36 20
C	Lever arm	Art. No. 602 35 30
E	Joint with screw	Art. No. 602 45 20
E	Disassembly head with magnet	Art. No. 602 46 50
F	Assembly head 1b (for valve keys)	Art. No. 600 01 02
G	Pressure pieces Gr. 6a, 3-piece	Art. No. 600 60 15
H	Plates, 3-piece	Art. No. 602 56 65
	Additional scope:	Not included in scope of delivery, article 600 50 00

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ENGINE Cylinder head, valve drive - Boxster And Cayman

I	Valve locating screws set, 4-piece	Art. No. 609 64 50
J	Screws with washer (4 ea.)	M6 x 40

Component overview of cylinder head

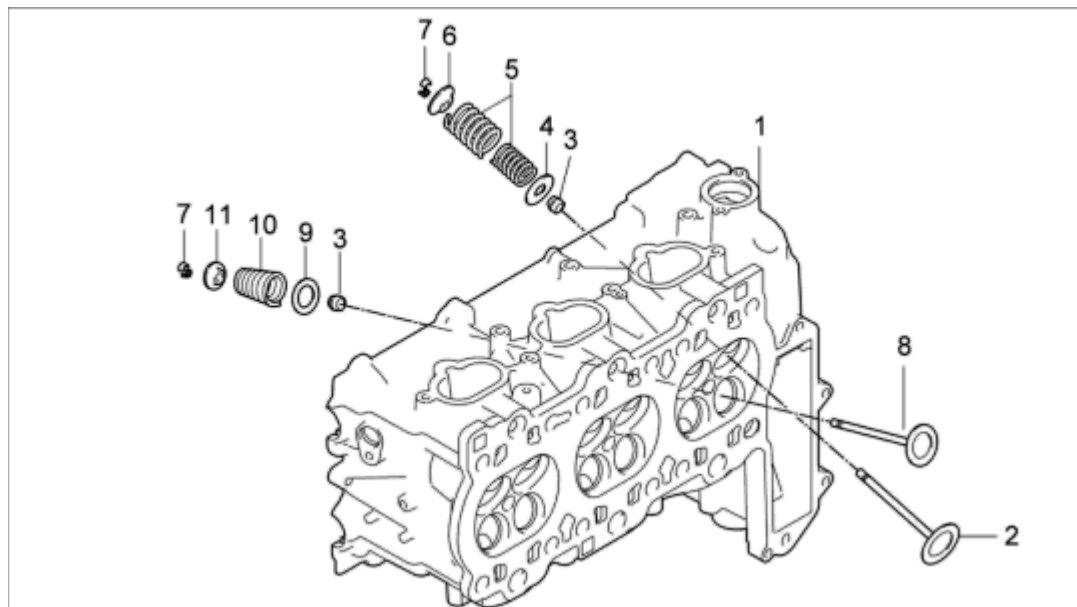


Fig. 182: Cylinder head components

Courtesy of PORSCHE OF NORTH AMERICA, INC.

NOTE: Reusable inner parts of the cylinder head must always be cleaned thoroughly and assigned to their original installation location.

Item	Designation	Removal	Fitting
1	Cylinder head	A second person should help with removing and positioning	Replacing cylinder-head gasket; pay attention to the dowel pins
2	Intake valve	Check tilt play of valve guide if necessary; observe assignment.	Lightly oil valve stem
3	Valve stem seal	Use puller 3364	Replace; use 9606 assembly driver
4	Lower valve-spring plate (intake)		
5	Valve spring set (intake)		
6	Upper valve-spring plate (intake)		
7	Valve collets		
8	Exhaust valve	Check tilt play of valve guide if necessary; observe	Lightly oil valve stem

2007 Porsche Boxster

ENGINE Cylinder head, valve drive - Boxster And Cayman

		assignment.	
9	Lower valve-spring plate (exhaust)		
10	Valve spring (exhaust)		
11	Upper valve-spring plate (exhaust)		

1. Remove spark plugs, if not already done.

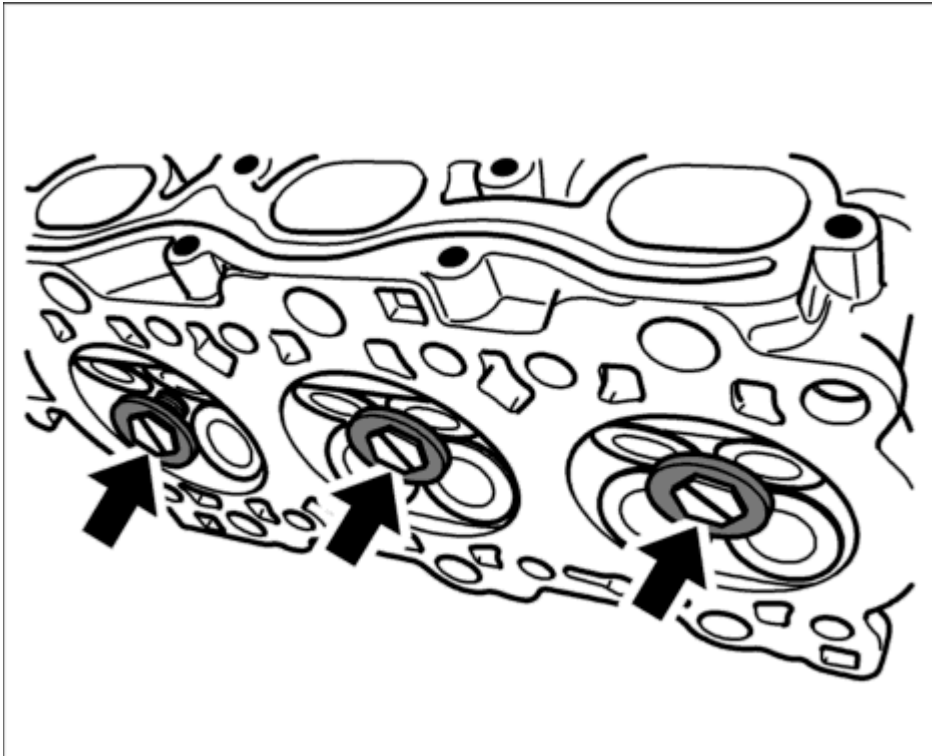


Fig. 183: Valve locating screws

Courtesy of PORSCHE OF NORTH AMERICA, INC.

2. Screw in the three valve locating screws -arrows- in the spark plug threads. See **Fig. 183**.

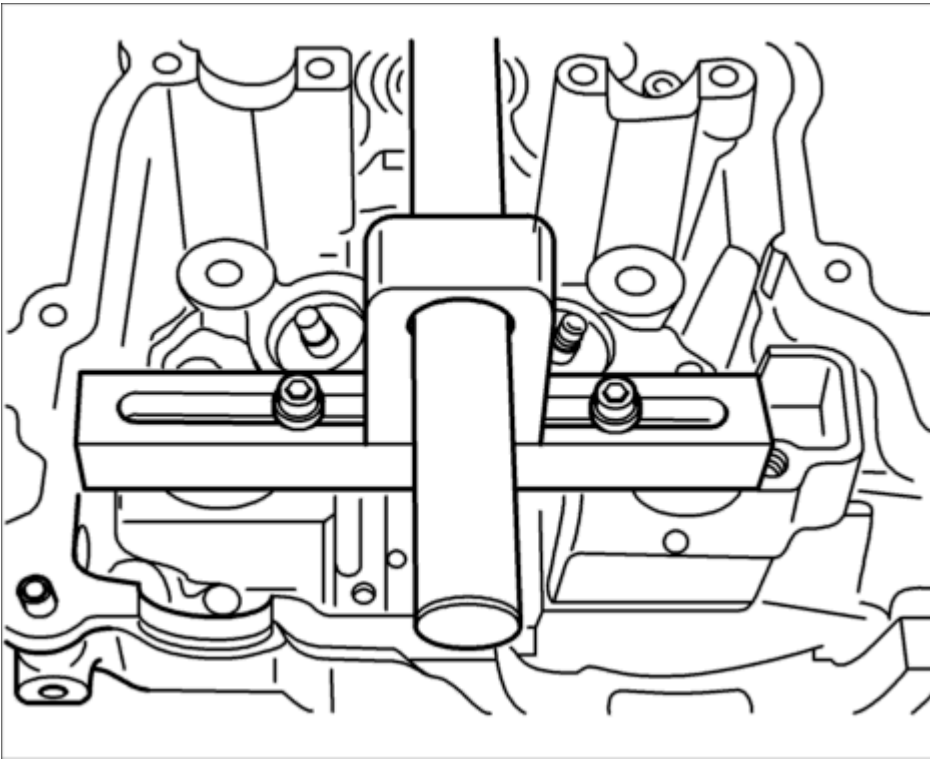


Fig. 184: Mounting aluminum supports

Courtesy of PORSCHE OF NORTH AMERICA, INC.

NOTE: Put the screw clamps for fixing the cylinder head only on the aluminum supports, under no circumstances on the sealing surface.

3. Align aluminum supports on the cylinder head with fastening screws. Fix cylinder head to the workbench with screw clamps. Slide on assembly shaft with the joint to the aluminum supports and fasten them.
4. Screw lever arm on joint and the disassembly head on the lever arm.
5. Place disassembly head on upper valve-spring plate and press together the valve springs with the lever arm. The valve keys and the concave washer stick due to the magnetic insert on the disassembly head. Repeat this process by moving the joint at the required valves.

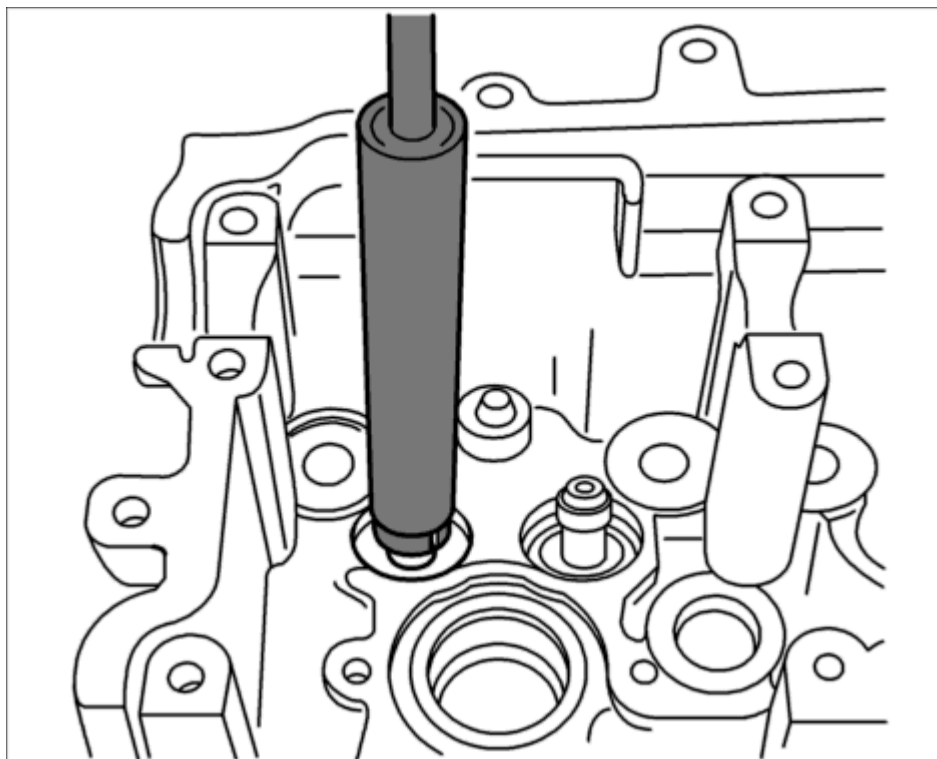


Fig. 185: Pulling off the valve-stem seal (VW-special tool 3364)

Courtesy of PORSCHE OF NORTH AMERICA, INC.

6. Using the VW special tool **puller 3364** pull off the valve-stem seal.
7. Check valve springs, valves, valve guides, and valve seats for damage.
8. Thoroughly clean cylinder head and all parts before assembling. Carry out repairs approved by PAG, if necessary.

ASSEMBLING CYLINDER HEAD

Assembling cylinder head

NOTE: Reusable inner parts of the cylinder head must always be cleaned thoroughly and assigned to their original installation location.

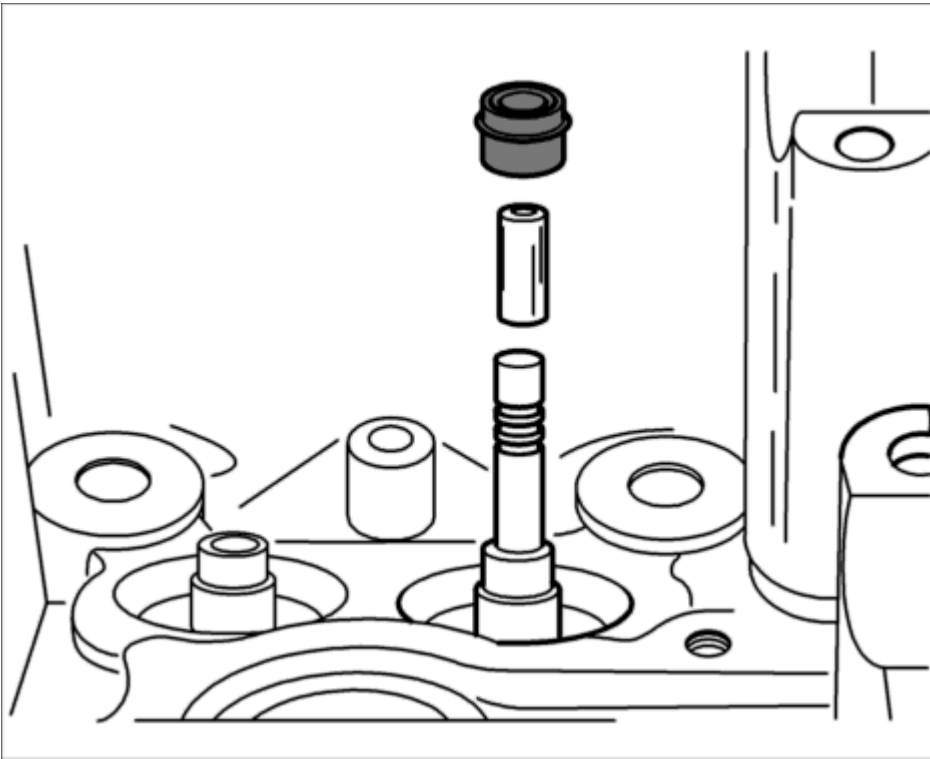


Fig. 186: Valve stem seal

Courtesy of PORSCHE OF NORTH AMERICA, INC.

NOTE: **Replace valve-stem seal.**

1. Insert lower valve-spring plate, oil valve stem lightly and position assembly sleeve (shim set for valve-stem seals). Either set new valve-stem seal on the assembly sleeve or insert in the **assembly driver P 9606**.

2007 Porsche Boxster

ENGINE Cylinder head, valve drive - Boxster And Cayman

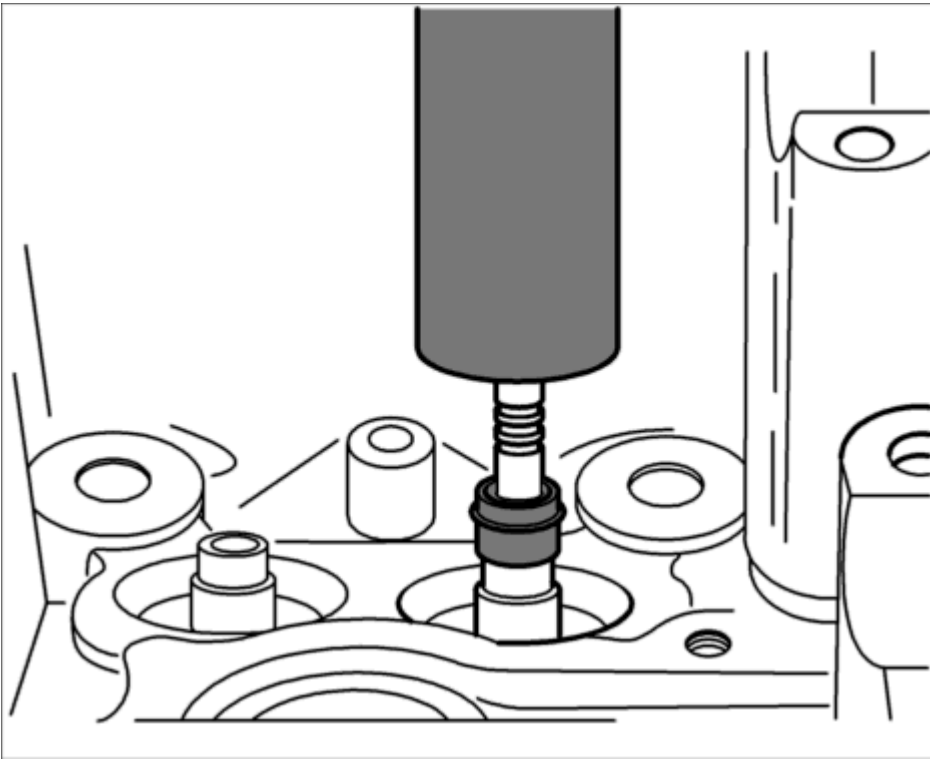


Fig. 187: Valve-stem seal on valve stem

Courtesy of PORSCHE OF NORTH AMERICA, INC.

2. Press valve-stem seal with the **assembly driver P 9606** up to the stop on the valve stem. Take off tool and assembly sleeve.

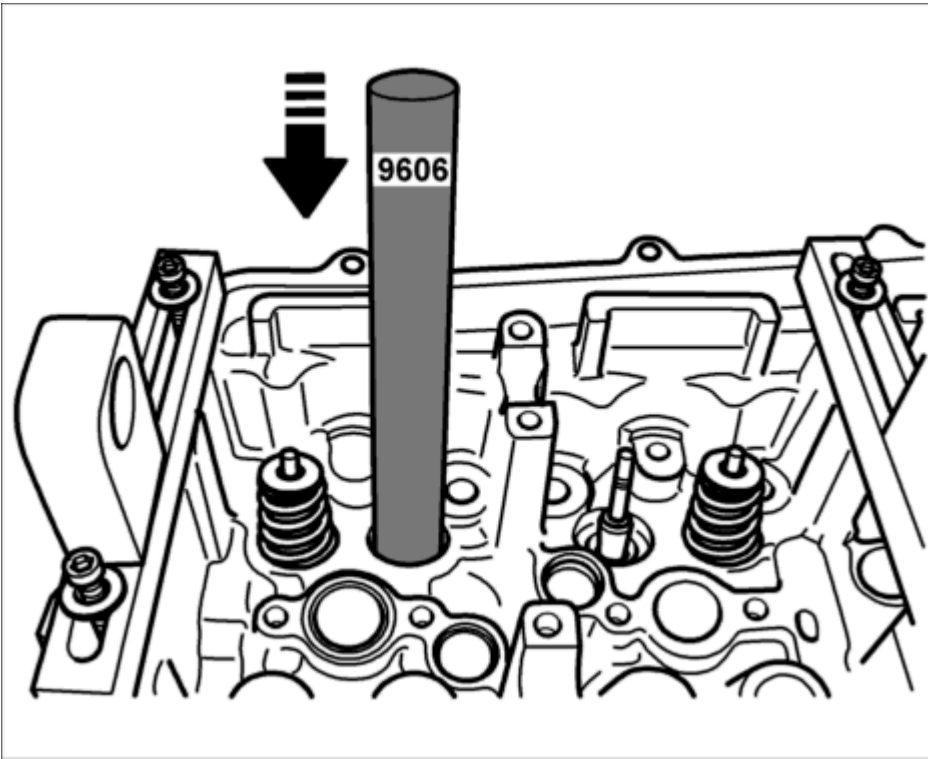


Fig. 188: Pressing in valve-stem seal

Courtesy of PORSCHE OF NORTH AMERICA, INC.

3. Insert corresponding valve spring(s) and upper valve-spring plate.

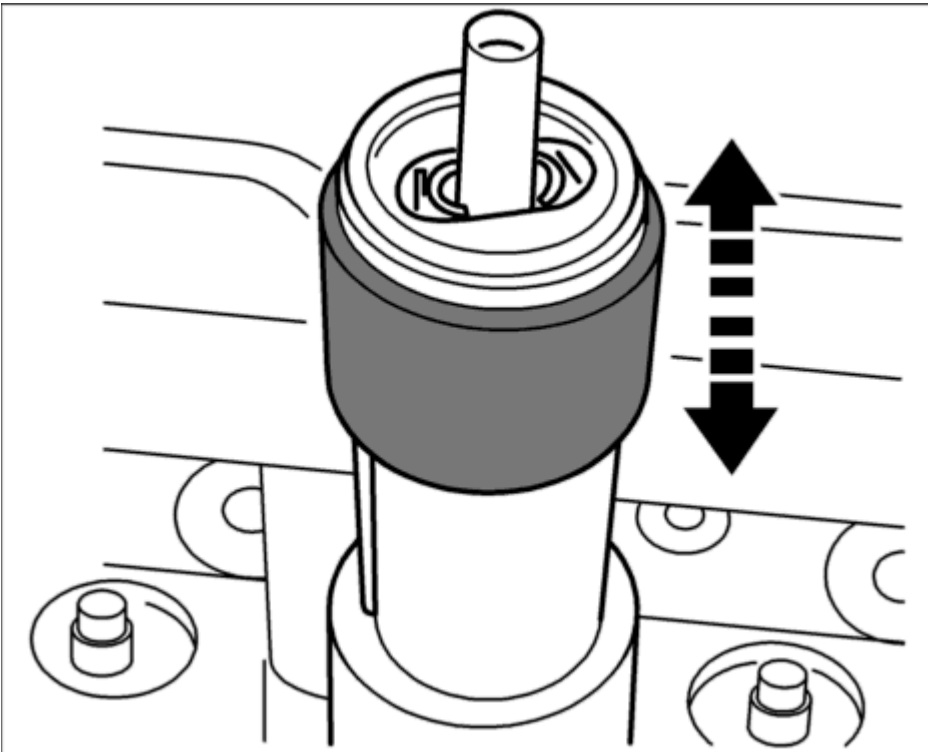
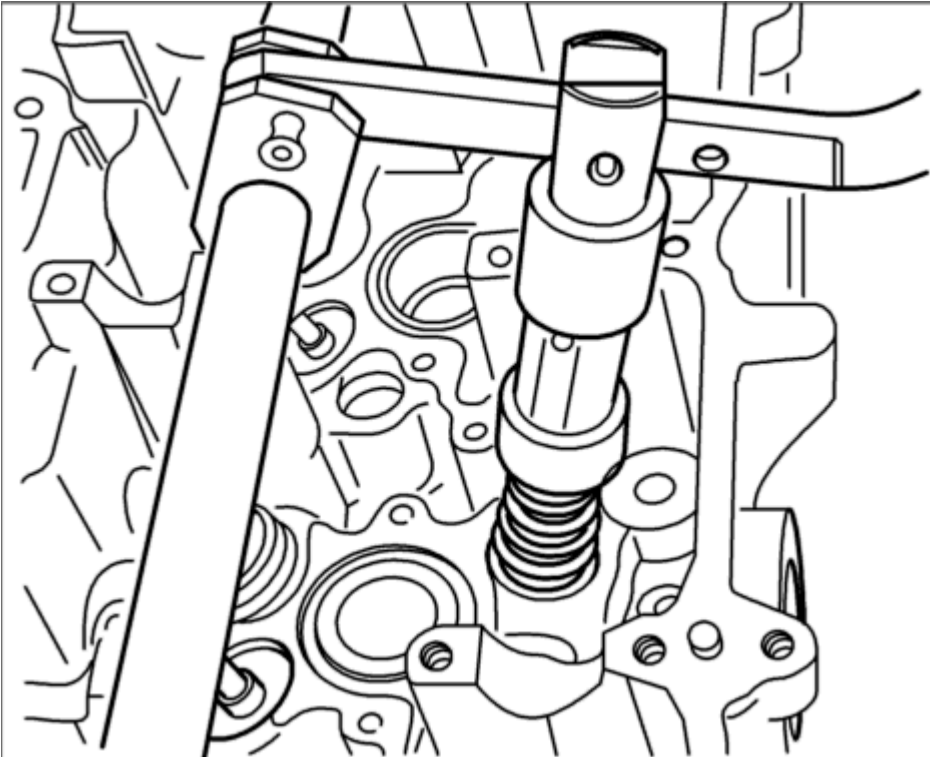


Fig. 189: Assembly head for valve keys

Courtesy of PORSCHE OF NORTH AMERICA, INC.

4. Fasten assembly head to lever arm. Push sliding sleeve downward to the stop and insert the valve keys. In order to ensure correct assembly, the wedges should be centered. Then push the sliding sleeve back again (valve keys fixed).

**Fig. 190: Mounting the valve keys**

Courtesy of PORSCHE OF NORTH AMERICA, INC.

5. Position assembly head with the pressure piece over the valve stem and align the assembly head so that it is aligned with the valve. Slowly press the assembly head downwards and guide it with your hand until a clicking sound can be heard. The valve keys are then automatically pressed into the correct installation position.

6. Swivel out the lever with the assembly head and check the seat of the valve keys. Repeat the process if necessary.

ASSEMBLING CYLINDER HEAD, TOUCHING UP

Assembling cylinder head, touching up

1. Install cylinder head --> **157019 Removing and installing side cylinder head - chapter on "Installing" [987310 987311 987320 987321]**.

2. Mount transmission. Refer to **34 35 27 Removing and refitting transmission - as of MY 2005 (Boxster, Boxster RHD)** . Refer to **34 35 27 Removing and refitting transmission - as of MY 2005 (Boxster S,**

Boxster S RHD, Cayman S, Cayman S RHD , or. Refer to **37 35 27 Removing and refitting the automatic transmission - as of MY 2005 (All Models)** .

3. Install engine. Refer to **10 01 19 Removing and installing engine - as of MY 2005 (Boxster, Boxster RHD, Boxster S, Boxster S RHD)** . Refer to **10 01 19 Removing and installing engine - as of MY 2005 (Cayman S, Cayman S RHD)** .

15 70 49 MACHINING THE CYLINDER HEAD - AS OF MY 2005 (ALL MODELS)

PRELIMINARY WORK

Preliminary work for machining cylinder head

1. Remove cylinder head --> **157019 Removing and installing cylinder head - chapter on "Removing" [987310 987311 987320 987321]**.
2. Disassemble cylinder head --> **157037 Disassembling and assembling cylinder head - chapter on "Disassembling"**.

MACHINING THE CYLINDER HEAD

Machining the cylinder head

1. Measure cylinder head height on a level surface (surface plate recommended).

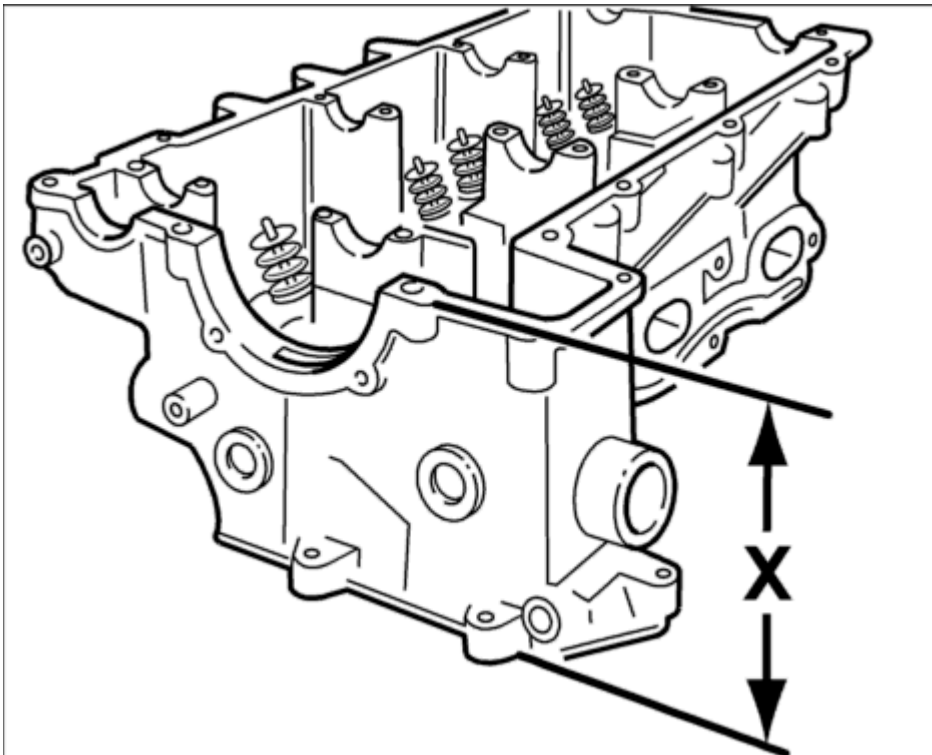
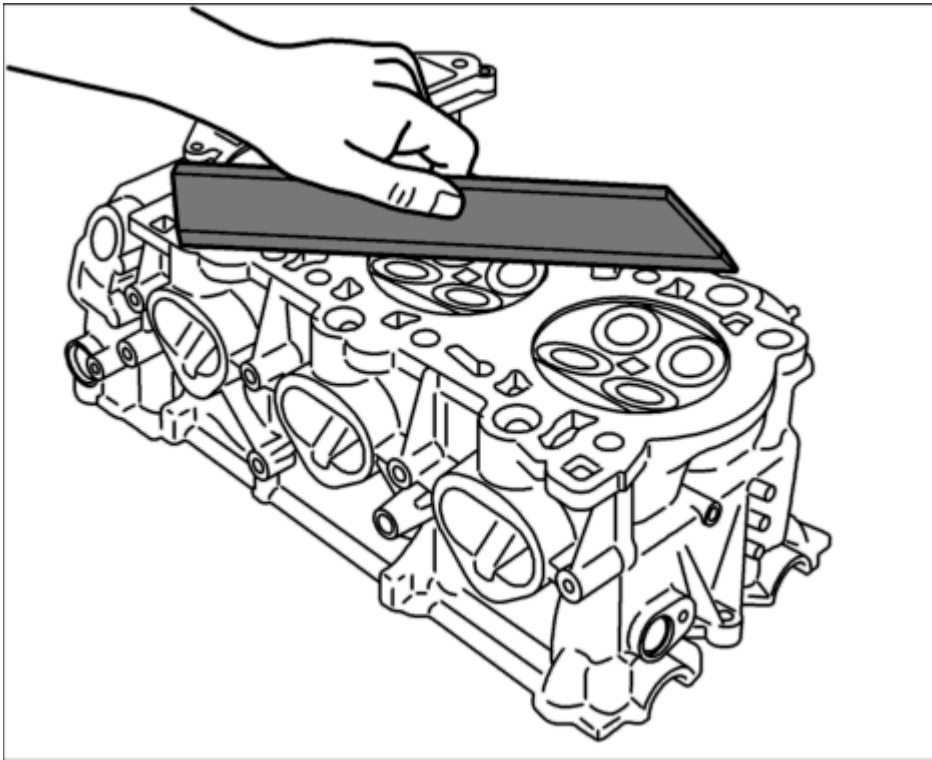


Fig. 191: Cylinder head height

Courtesy of PORSCHE OF NORTH AMERICA, INC.

Standard dimension -X- : 142.0 ± 0.1 mm. See **Fig. 191**.

2. Check combustion chamber sealing face of the cylinder head for distortion (flatness) using a straight-edge and feeler gauge.

**Fig. 192: Flatness of sealing face of cylinder head (diagonal)**

Courtesy of PORSCHE OF NORTH AMERICA, INC.

Permissible unevenness of parting surface for used cylinder head: 0.05 mm

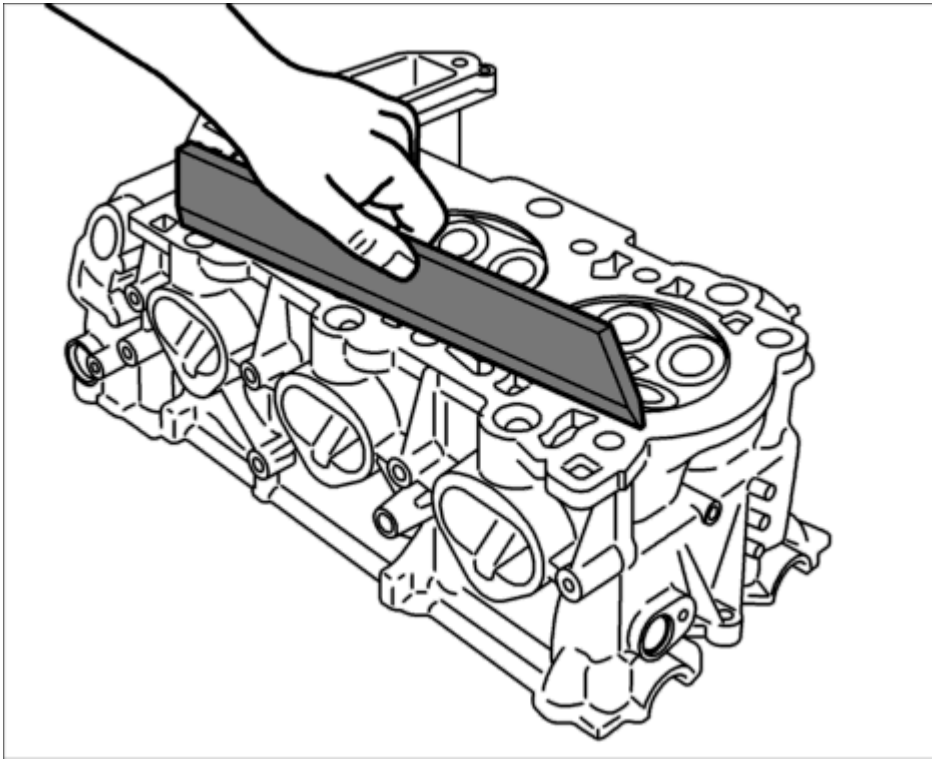


Fig. 193: Flatness of cylinder head (longitudinal)

Courtesy of PORSCHE OF NORTH AMERICA, INC.

3. Cylinder heads with distorted or scored sealing surface can be repaired by plain-milling them. The following machining criteria must be observed.

Permissible unevenness after machining: 0.03 mm

Permissible roughness profile (can be measured with contact stylus procedure): 15 pt 14

Permissible surface depth from standard dimension: 0.15 ± 0.05 mm

SUBSEQUENT WORK

Subsequent work for machining cylinder head

1. Assemble cylinder head --> **157037 Disassembling and assembling cylinder head - chapter on "Assembling"**.

2. Install cylinder head --> **157037 Disassembling and assembling cylinder head - chapter on "Installing"**.

15 75 02 CHECKING VALVE GUIDE (VALVE LATERAL PLAY) - AS OF MY 2005 (ALL MODELS)

TOOLS

2007 Porsche Boxster

ENGINE Cylinder head, valve drive - Boxster And Cayman

Designation	Type	Number	Explanation	
cover for dust protection when fitting the engine	special tool	NR.165		
retaining device	special tool	P 9739		

PRELIMINARY WORK

Preliminary work

CAUTION: Risk of damage due to particles of dirt.

- Oil bores/oil ducts can become blocked up.

--> When working on the engine, absolute cleanliness is essential.

--> Lay removed engine parts on a clean base and cover them without fail.

--> Use the **cover for dust protection when fitting the engine NR.165** on the engine assembly support.

CAUTION: Incorrect tray.

- Damaged and scratched sealing face.

--> Work on cylinder head only on a clean surface on the work bench.

1. Remove cylinder head --> **157019 Removing and installing cylinder head - chapter on "Removing" [987310 987311 987320 987321]**.

2. Disassemble cylinder head and clean components --> **157037 Disassembling and assembling cylinder head - chapter on "Disassembling"**.

CHECKING VALVE GUIDE (VALVE LATERAL PLAY)

Checking valve guide (valve lateral play)

2007 Porsche Boxster

ENGINE Cylinder head, valve drive - Boxster And Cayman

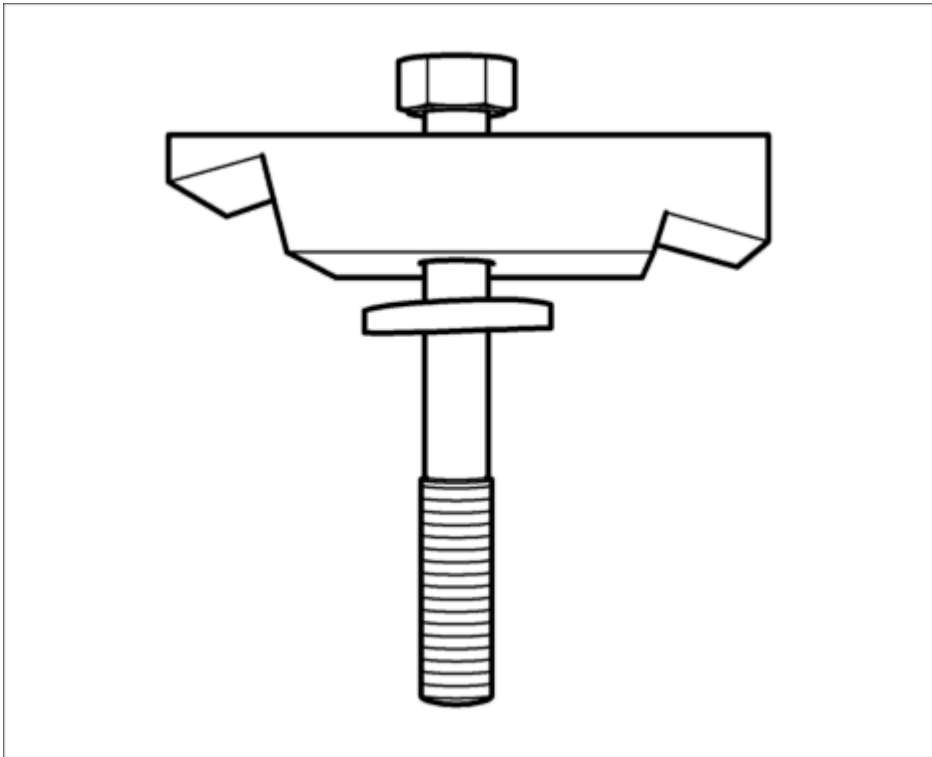


Fig. 194: Tool for fixing valve position

Courtesy of PORSCHE OF NORTH AMERICA, INC.

Special tool retaining device P 9739

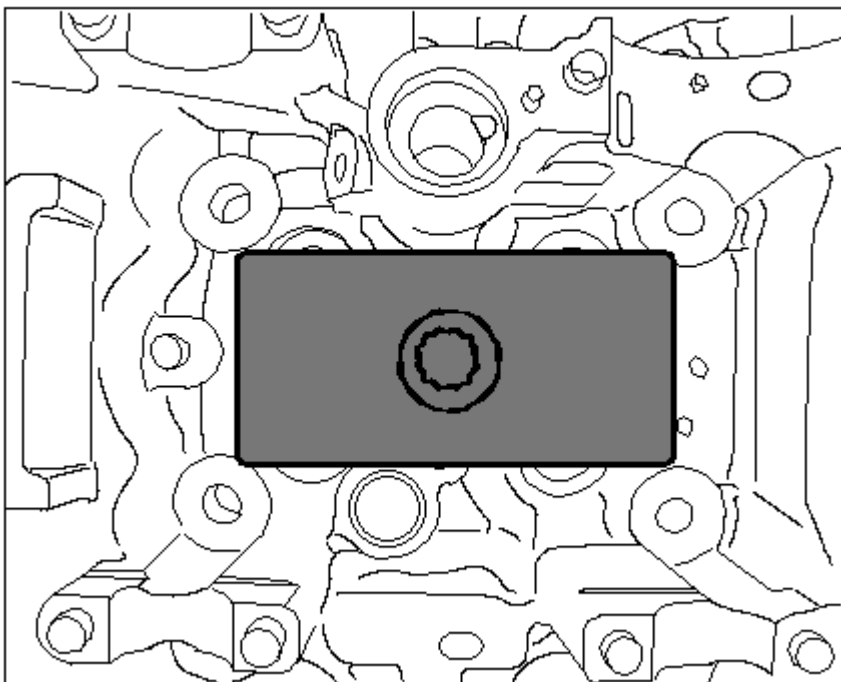
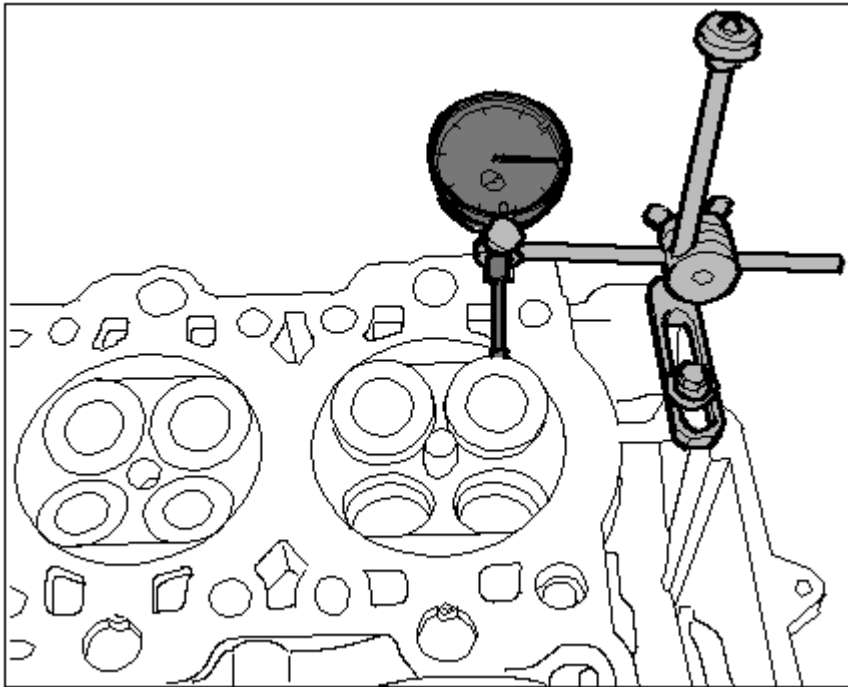


Fig. 195: Special tool 9739 fitted

Courtesy of PORSCHE OF NORTH AMERICA, INC.

1. Fit special tool **retaining device P 9739** in cylinder head (valve stem side). To do this, screw in the fastening screws by hand into the spark plug thread.

**Fig. 196: Checking valve tilt play of intake valve**

Courtesy of PORSCHE OF NORTH AMERICA, INC.

NOTE: The permitted valve tilt play is 0.25 mm.

2. Check valve tilt play on intake valve. Adjust the dial gauge to the relevant angle of the valve to be checked and set to '0' with preload. Press valve disc towards dial gauge and pull it back again. Read off value and note it.

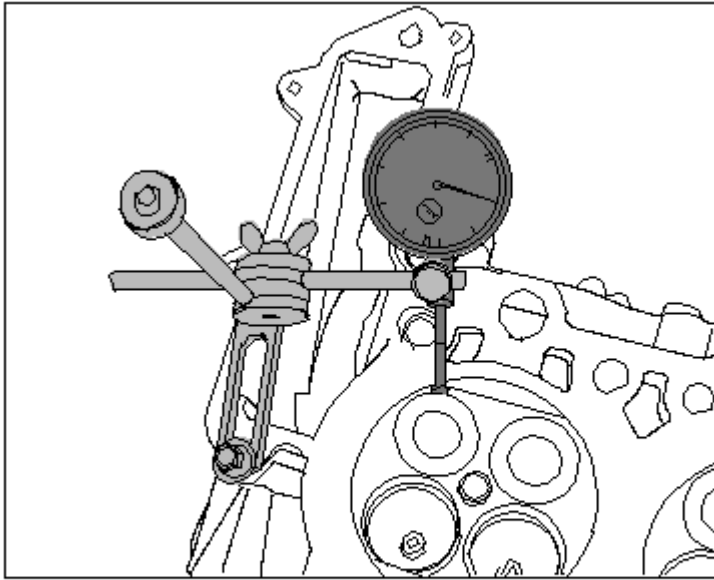


Fig. 197: Checking valve tilt play on exhaust valve
 Courtesy of PORSCHE OF NORTH AMERICA, INC.

3. Check valve tilt play on exhaust valve. Adjust the dial gauge to the relevant angle of the valve to be checked and set to '0' with preload. Press valve disc towards dial gauge and pull it back again. Read off value and note it.

4. Check all valves.

SUBSEQUENT WORK

Subsequent work

1. When all valve guides are within the permitted tolerances, assemble cylinder head again. If the specification is exceeded, the cylinder head must be replaced.

2. Install cylinder head --> **157019 Removing and installing side cylinder head - chapter on "Installing" [987310 987311 987320 987321].**

15 82 20 REMOVING AND INSTALLING CYLINDER HEAD COVER - ENGINE REMOVED - AS OF MY 2005 (CAYMAN S, CAYMAN S RHD)

TOOLS

Designation	Type	Number	Explanation	
cover for dust protection when fitting the engine	special tool	NR.165		

REMOVING CYLINDER HEAD COVER - ENGINE REMOVED

Removing cylinder head cover M97/21

CAUTION: Risk of damage due to particles of dirt.

- Oil bores/oil ducts can become blocked up.

--> When working on the engine, absolute cleanliness is essential.

--> Lay removed engine parts on a clean base and cover them without fail.

--> Use the cover for dust protection when fitting the engine NR.165 on the engine assembly support.

NOTE: The coated screws for the bearing surfaces of the camshaft in the cylinder head cover must be replaced when installing.
Replace O-ring on the oil suction pump (or tandem pump).

Cylinder row 1-3:

1. Disconnect oil pressure switch cable plug.

2. Disconnect and remove cable plugs for ignition coils. Remove ignition coils -1-. To do this, unscrew each of the two Torx screws (M6 x 25) and remove the ignition coils from the spark-plug recess. See **Fig. 198**.

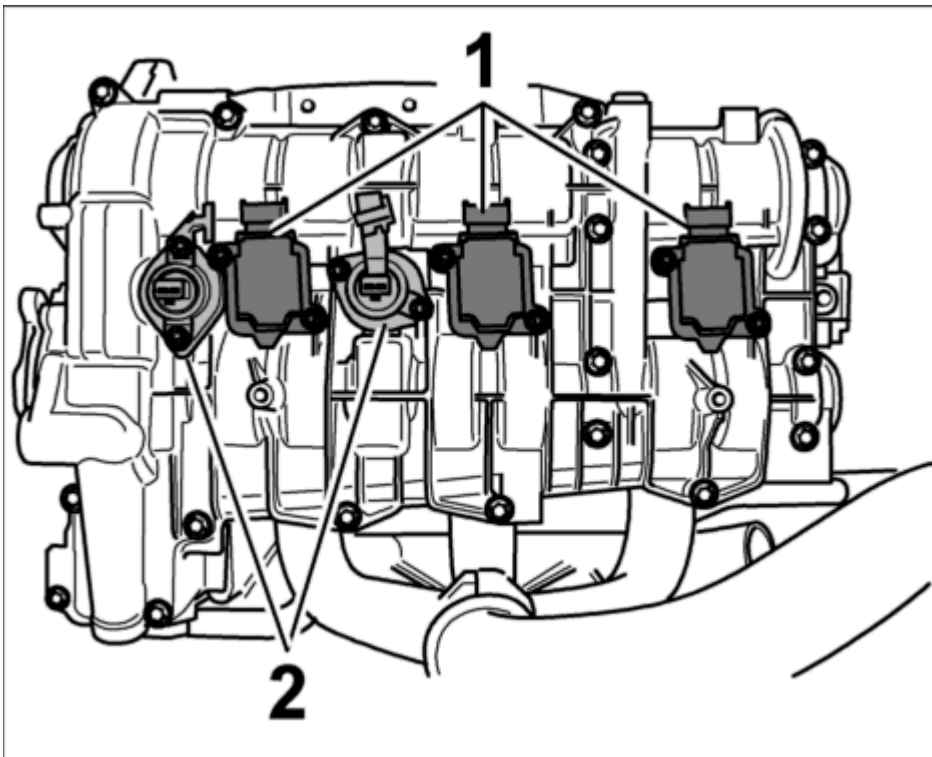


Fig. 198: Hydraulic valves for camshaft adjustment and ignition coils

Courtesy of PORSCHE OF NORTH AMERICA, INC.

3. Remove support and retainer plates (with integrated seal) for the solenoid hydraulic valves (camshaft adjustment and valve lift control) -2- , --> **153719 Removing and installing solenoid hydraulic valve for camshaft timing - chapter on "Removing"** . If the valves do not have to be replaced, these can remain in the cylinder head (side 1-3 both, side 4-6 camshaft timing only). See **Fig. 198**.

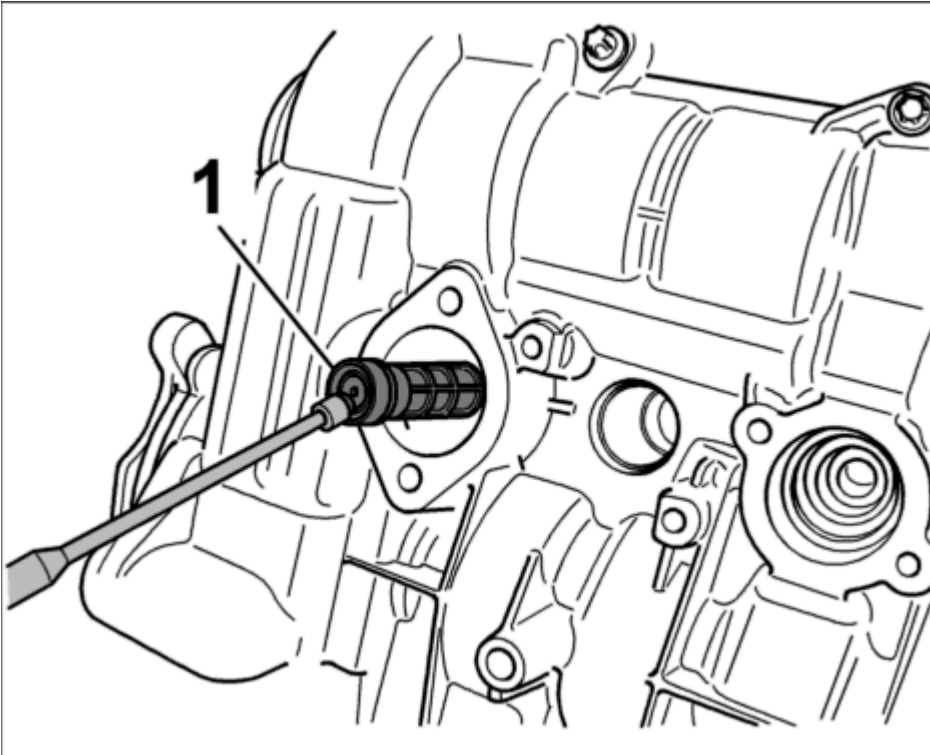


Fig. 199: Oil strainer in hydraulic valve for camshaft adjustment
Courtesy of PORSCHE OF NORTH AMERICA, INC.

4. If the solenoid hydraulic valve for camshaft adjustment is removed, the oil strainer -1- must be checked for damage and contamination, and replaced if necessary. See **Fig. 199**.

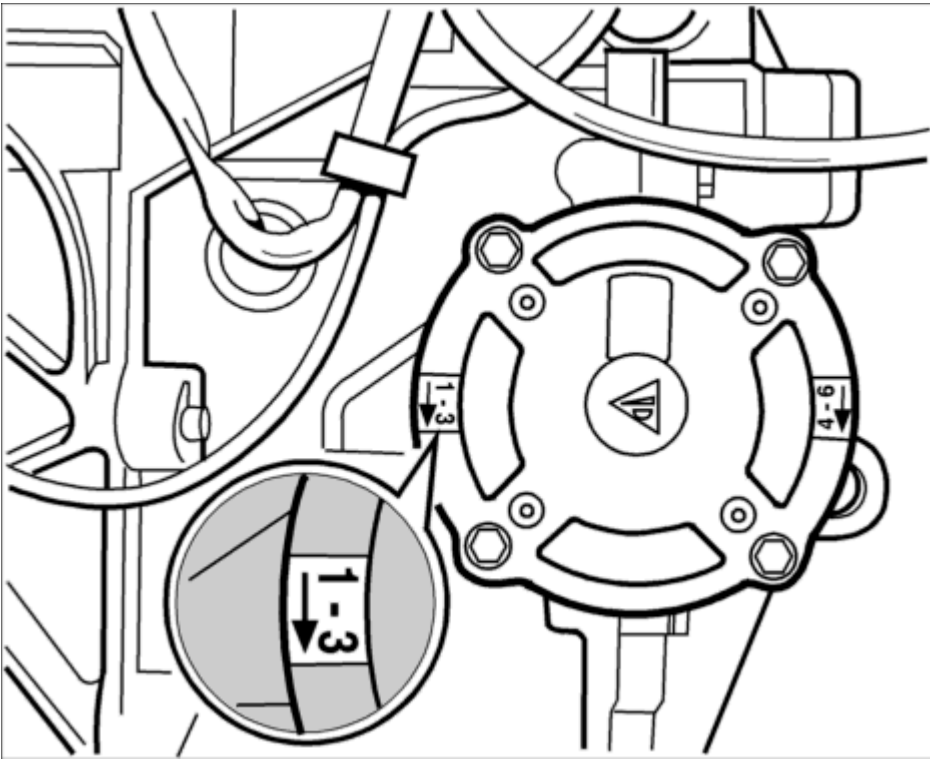


Fig. 200: Oil suction pump 1 - 3

Courtesy of PORSCHE OF NORTH AMERICA, INC.

5. Remove oil suction pump 1 - 3. Unscrew four M6 x 20 Torx screws (micro-self-locking), remove oil suction pump, replace O-ring and screws.
6. Unclip oxygen sensor line from the brackets.

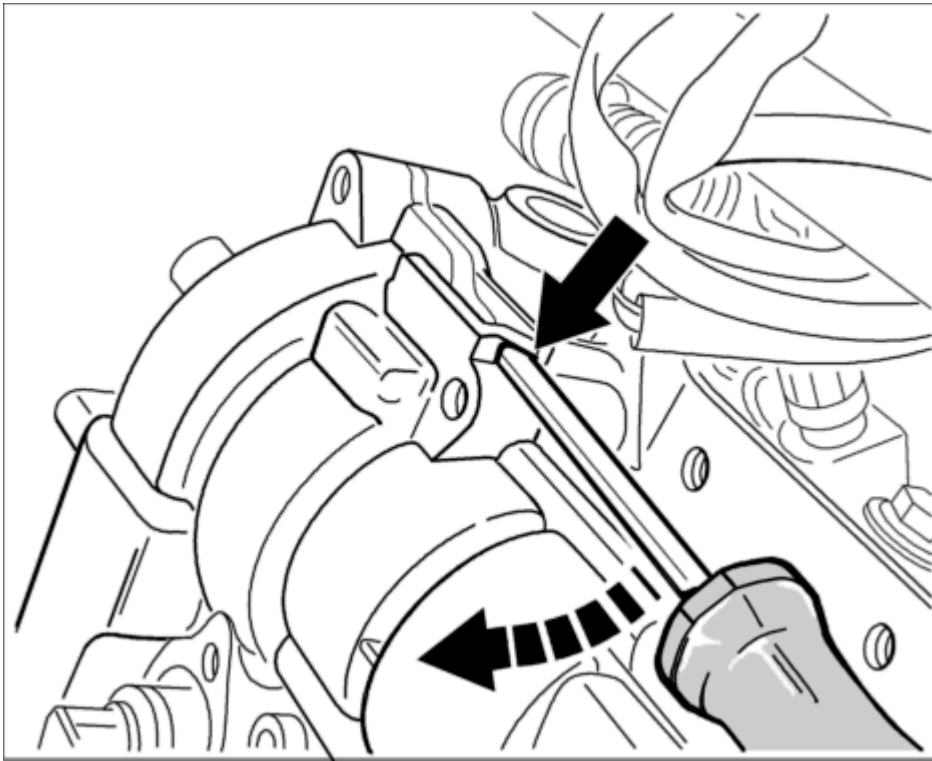


Fig. 201: Lifting cylinder head cover from above
Courtesy of PORSCHE OF NORTH AMERICA, INC.

CAUTION: Damage when levering off the cylinder head cover

- **Cast lugs could break.**

--> Perform work steps carefully and gently.

7. Remove cylinder head cover. Unscrew 20 M6 x 30 Torx screws from the cylinder head cover. To loosen the cylinder head cover, raise the cover carefully at the two protruding cast edges with a screwdriver or mounting lever. Remove cylinder head cover.

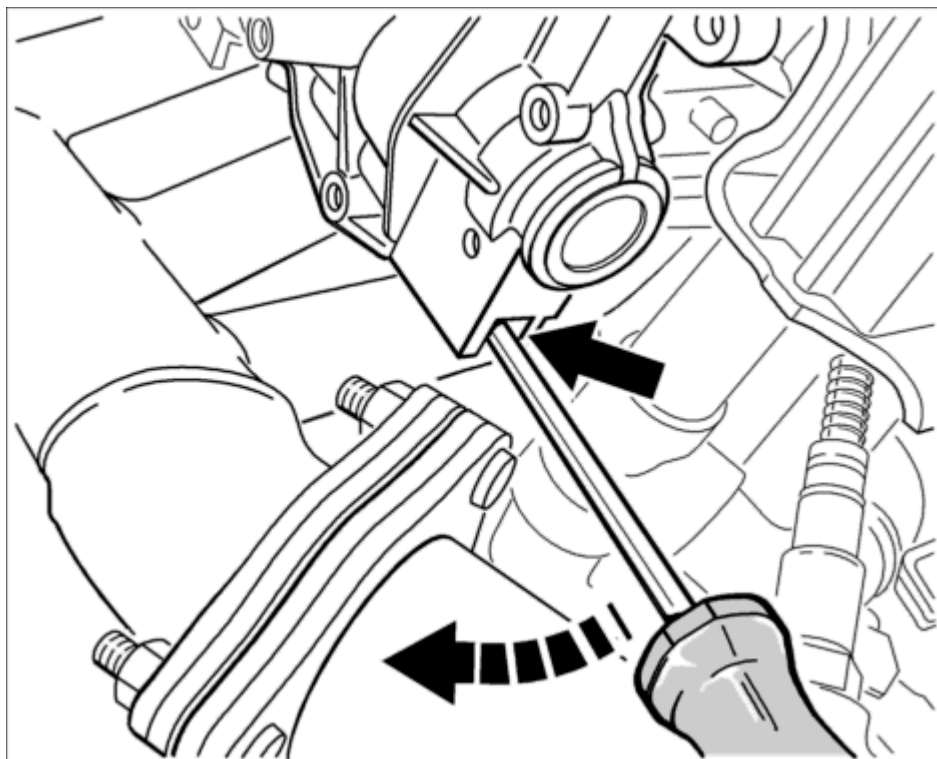


Fig. 202: Lifting cylinder head cover from below
Courtesy of PORSCHE OF NORTH AMERICA, INC.

8. Remove the plastic cap.

NOTE: **Make sure that it is cleaned thoroughly and that residual sealing compound is removed completely. Even the smallest particles can block up oil bores.**

9. Clean the sealing faces on the cylinder head cover and cylinder head thoroughly (use a brass or nylon brush, a clean and lint-free cloth soaked in acetone). All residual sealing compound in the cylinder head and on the cover must be removed before assembly.

Additional work steps on cylinder row 4-6:

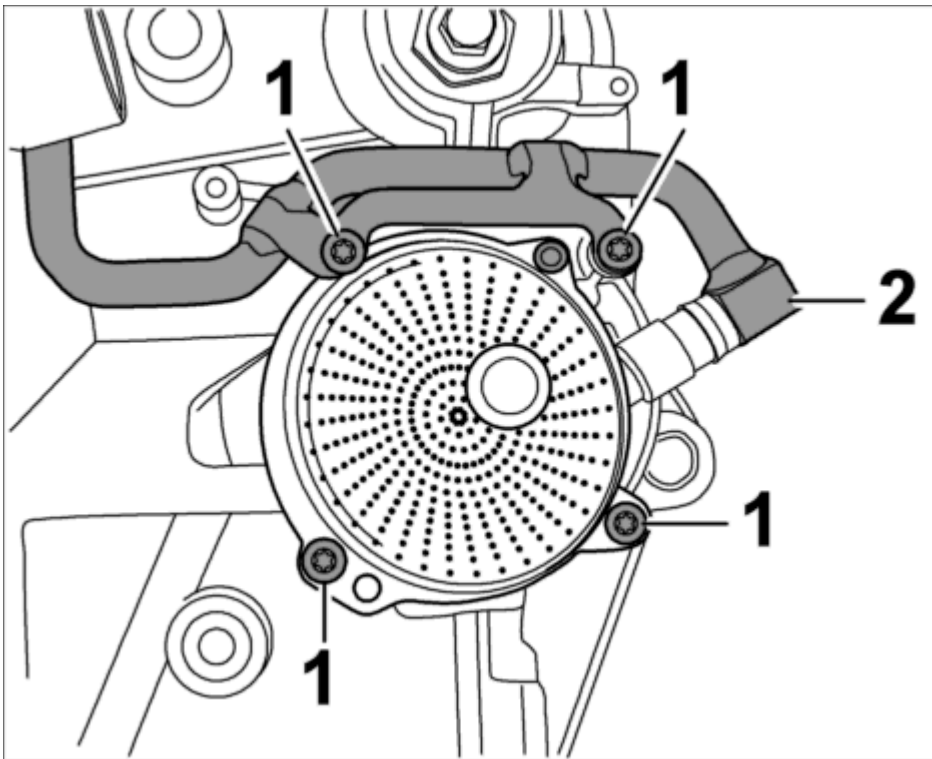


Fig. 203: Tandem pump side 4-6

Courtesy of PORSCHE OF NORTH AMERICA, INC.

- A tandem pump is installed on side 4-6 instead of the oil suction pump. Pull off the vacuum line on the pump - 2- . Replace O-rings and micro-self-locking screws -1- . See **Fig. 203**.

INSTALLING CYLINDER HEAD COVER - ENGINE REMOVED

Installing cylinder head cover M97/21

CAUTION: Risk of damage due to particles of dirt.

- Oil bores/oil ducts can become blocked up.

--> When working on the engine, absolute cleanliness is essential.

--> Lay removed engine parts on a clean base and cover them without fail.

--> Use the **cover for dust protection when fitting the engine NR.165** on the engine assembly support.

NOTE: The coated screws for the bearing surfaces of the camshaft in the cylinder head cover must be replaced when installing.

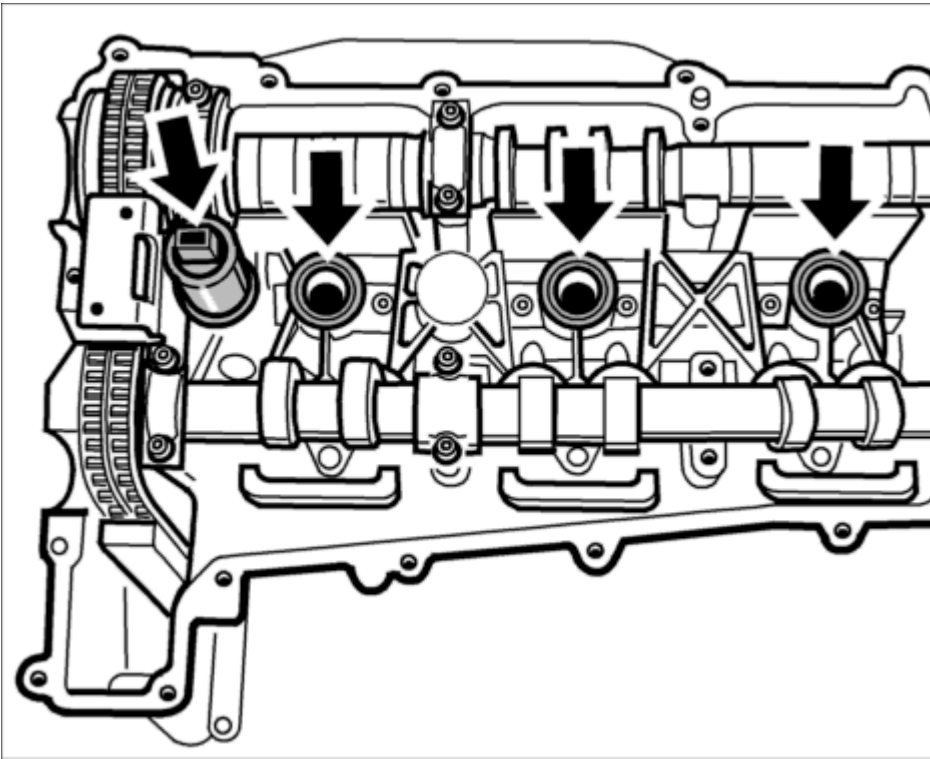


Fig. 204: Spark plug slot seals and solenoid hydraulic valves

Courtesy of PORSCHE OF NORTH AMERICA, INC.

1. Insert three new seals for the spark-plug recesses.

Only the following sealants may be used to seal the cylinder head cover:

- "Drei Bond" silicone - type 1209
- Loctite 5900

2. Prepare cylinder head cover for assembly. Apply a thin bead of sealant on the cylinder head cover (not more than 1.5 mm high). --> *Sealant application on cylinder head cover* . See **Fig. 205**.

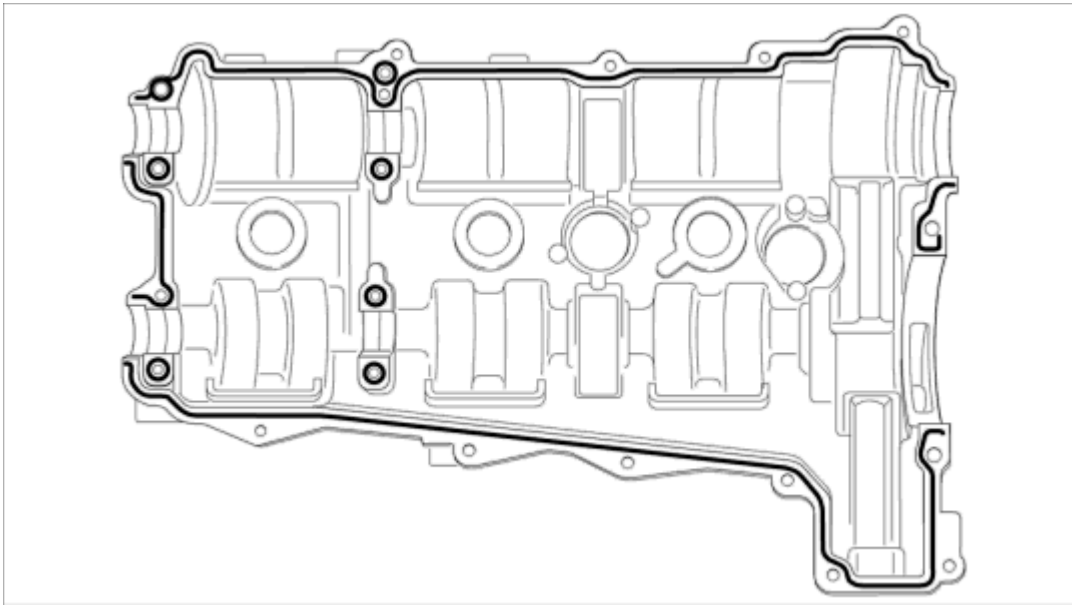


Fig. 205: Sealant application on cylinder head cover
Courtesy of PORSCHE OF NORTH AMERICA, INC.

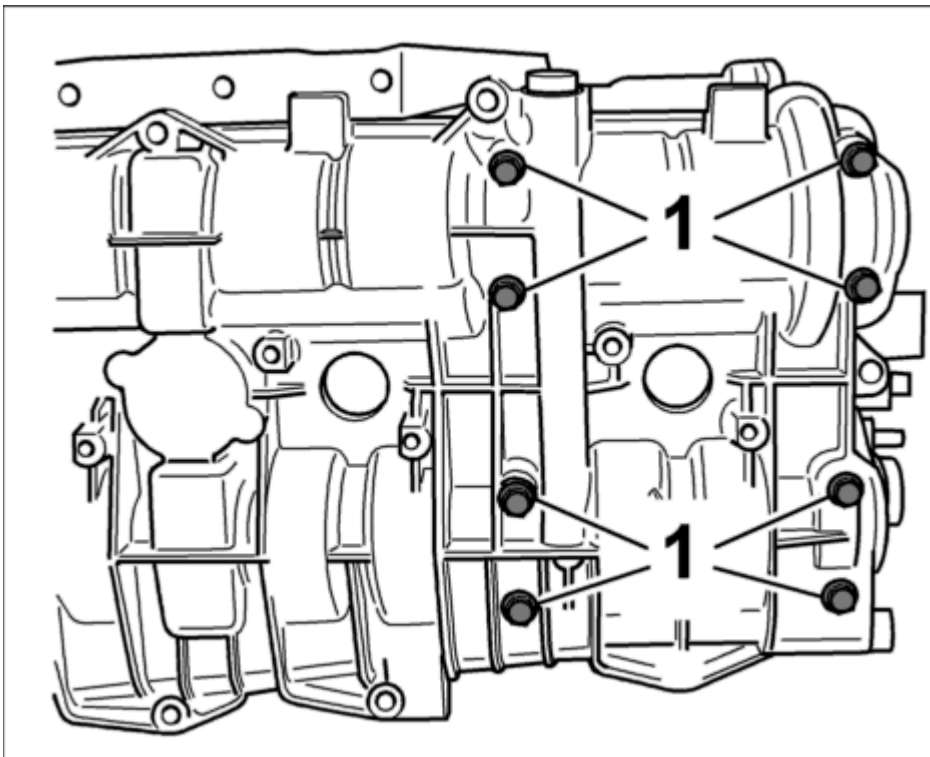


Fig. 206: Screws for camshaft bearing surface
Courtesy of PORSCHE OF NORTH AMERICA, INC.

3. Coated screws on the camshaft bearing surfaces -1- must be replaced. See **Fig. 206**.
4. Place the cylinder head cover carefully onto the cylinder head. The bead of sealing compound must not be

wiped off or broken.

5. Position 20 Torx screws (eight of these should be new, coated screws **-1-4 and 7-10-**) on the cylinder head cover and tighten according to the specified tightening sequence. Only lightly screw in the two screws in the area of the oil suction pump/tandem pump. They will be tightened after the pump is assembled. --> **Tightening torque: 13 (9.5 ftlb.) Nm** . See Fig. 207.

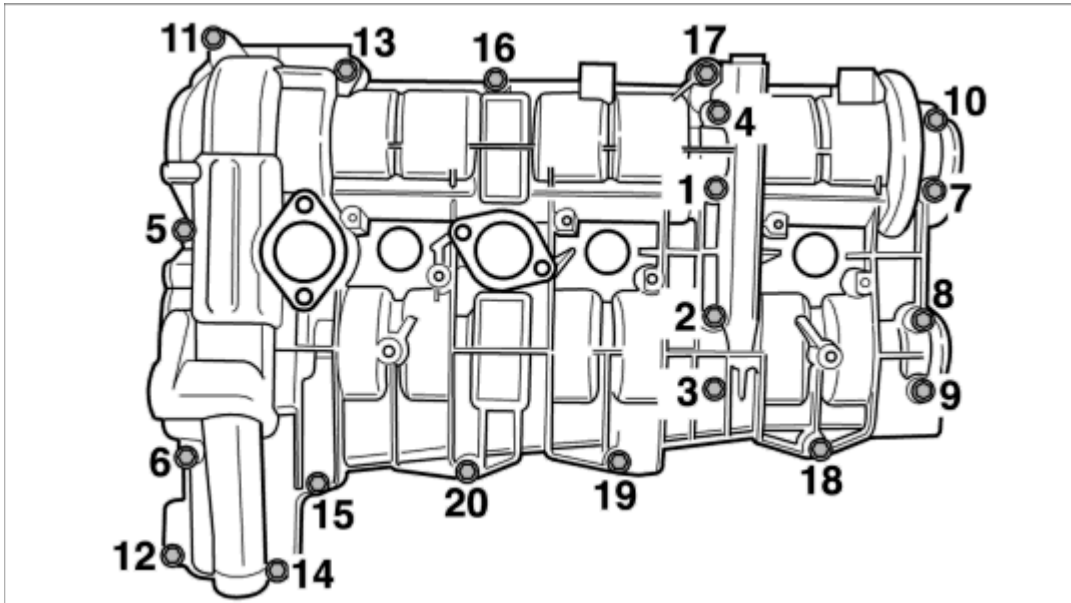


Fig. 207: Tightening sequence for cylinder head cover
 Courtesy of PORSCHE OF NORTH AMERICA, INC.

6. Position a new cap ø 45 mm (brown) on the bore of the intake camshaft on the pulley side and tap it gently into place with a plastic hammer (dry mount).

7. Insert two new caps (green) into the small bores on the clutch side. Tap it in with a plastic hammer (dry mount).

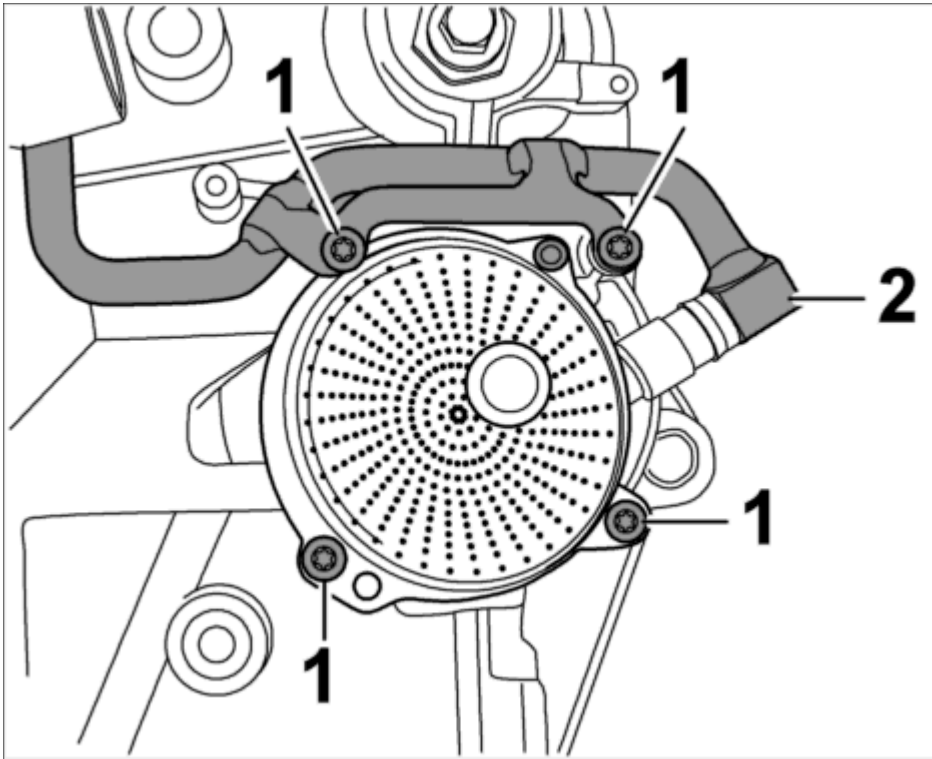


Fig. 208: Tandem pump side 4 -6

Courtesy of PORSCHE OF NORTH AMERICA, INC.

NOTE: Replace O-ring on the oil suction pump (or tandem pump).

8. Mount the oil suction pump or tandem pump with four new, micro-self-locking Torx screws **-1-** . Replace O-rings on the pumps and the vacuum line **-2-** . Grease O-rings with Optimol MP3. --> **Tightening torque: 10 (7.5 ftlb.) Nm** . See **Fig. 208**.

9. Tighten the two screws on cylinder head cover in area of oil suction pump/tandem pump. --> **Tightening torque: 13 (9.5 ftlb.) Nm**

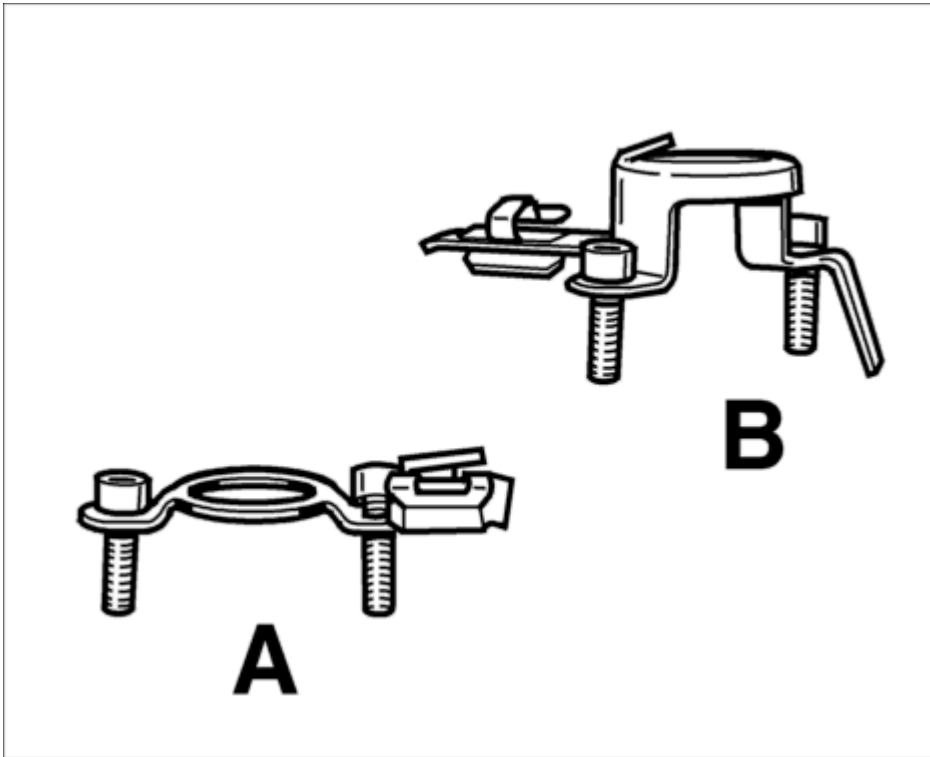


Fig. 209: Holder for solenoid hydraulic valves

Courtesy of PORSCHE OF NORTH AMERICA, INC.

10. Push new retainer plates (with integrated seal) onto solenoid hydraulic valves. Position support and tighten with two Torx screws (M6 x 20). --> **Tightening torque: 10 (7.5 ftlb.) Nm**

- A: Support for camshaft adjustment valve (camshaft timing)
- B: Support for valve lift adjustment valve (valve lift control)

2007 Porsche Boxster

ENGINE Cylinder head, valve drive - Boxster And Cayman

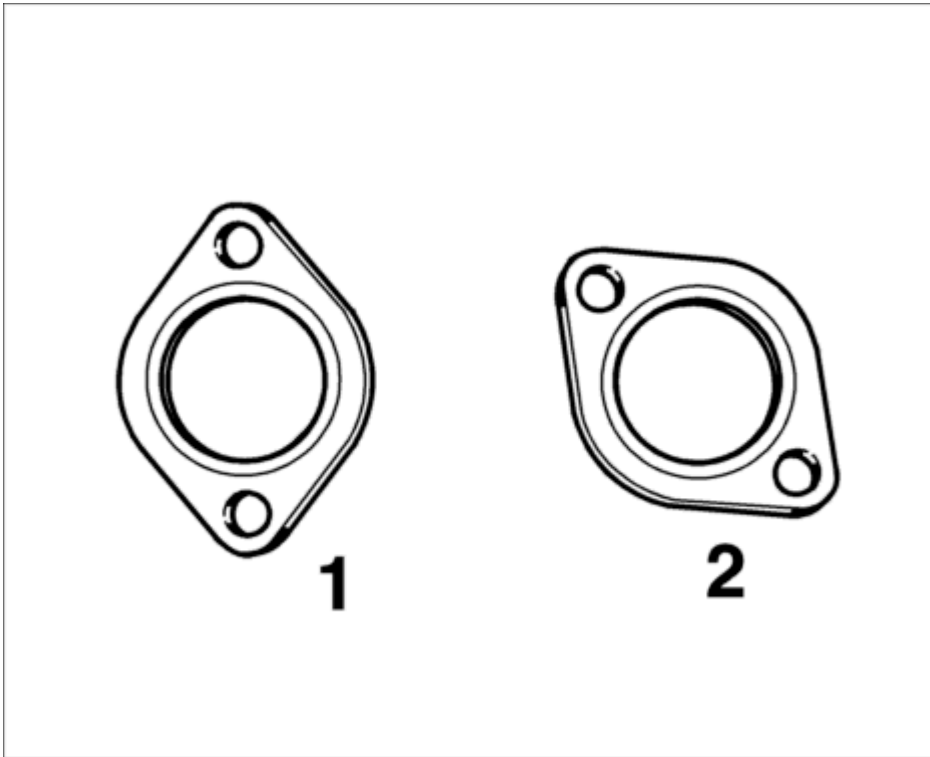


Fig. 210: Installation position for solenoid hydraulic valve retainer plates
Courtesy of PORSCHE OF NORTH AMERICA, INC.

- 1 - Camshaft timing retainer plate
- 2 - Valve lift control retainer plate

11. Insert ignition coils into the spark-plug recesses. Position and tighten two M6 x 25 Torx screws per ignition coil. --> **Tightening torque: 10 (7.5 ftlb.) Nm**

12. Plug in cable plugs for ignition coils and solenoid hydraulic valves. Clip the cables of the hydraulic valves into the brackets.

13. Connect cable plug to oil temperature switch.

14. Clip oxygen sensor lines into brackets.

15 82 20 REMOVING AND INSTALLING CYLINDER HEAD COVER - ENGINE REMOVED - AS OF MY 2005 (BOXSTER, BOXSTER RHD, BOXSTER S, BOXSTER S RHD)

TOOLS

Designation	Type	Number	Explanation	
cover for dust protection when fitting the engine	special tool	NR.165		

PRELIMINARY WORK**Preliminary work**

1. Remove engine. Refer to **10 01 19 Removing and installing engine - as of MY 2005 (Boxster, Boxster RHD, Boxster S, Boxster S RHD)** .

REMOVING CYLINDER HEAD COVER - ENGINE REMOVED

Removing cylinder head cover M96/25 and M96/26

CAUTION: Risk of damage due to particles of dirt.

- Oil bores/oil ducts can become blocked up.

--> When working on the engine, absolute cleanliness is essential.

--> Lay removed engine parts on a clean base and cover them without fail.

--> Use the **cover for dust protection when fitting the engine NR.165** on the engine assembly support.

NOTE: **The coated screws for the bearing surfaces of the camshaft in the cylinder head cover must be replaced when installing.
Replace O-ring on the oil suction pump (or tandem pump).**

Cylinder row 1-3:

1. Disconnect oil pressure switch cable plug.

2. Disconnect and remove cable plugs for ignition coils. Remove ignition coils **-1-** ; to do this, unscrew each of the two Torx screws (M6 x 25) and remove the ignition coils from the spark-plug recess. See **Fig. 211**.

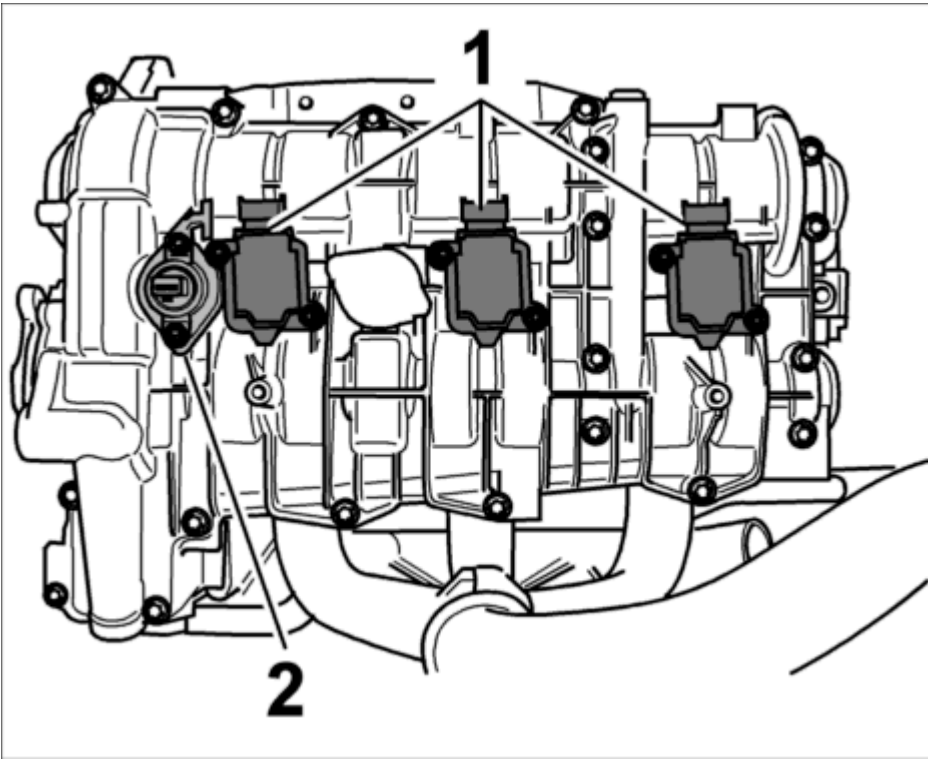


Fig. 211: Hydraulic valve for camshaft adjustment and ignition coils
Courtesy of PORSCHE OF NORTH AMERICA, INC.

3. If necessary, remove camshaft adjustment valve -2- by unscrewing the Torx screws (M6 x 20). Remove support and retainer plate (with integrated seal). Pull solenoid hydraulic valve for camshaft adjustment out of the bore if this needs to be replaced. Replace retainer plate (with integrated seal) during installation. See **Fig. 211**.

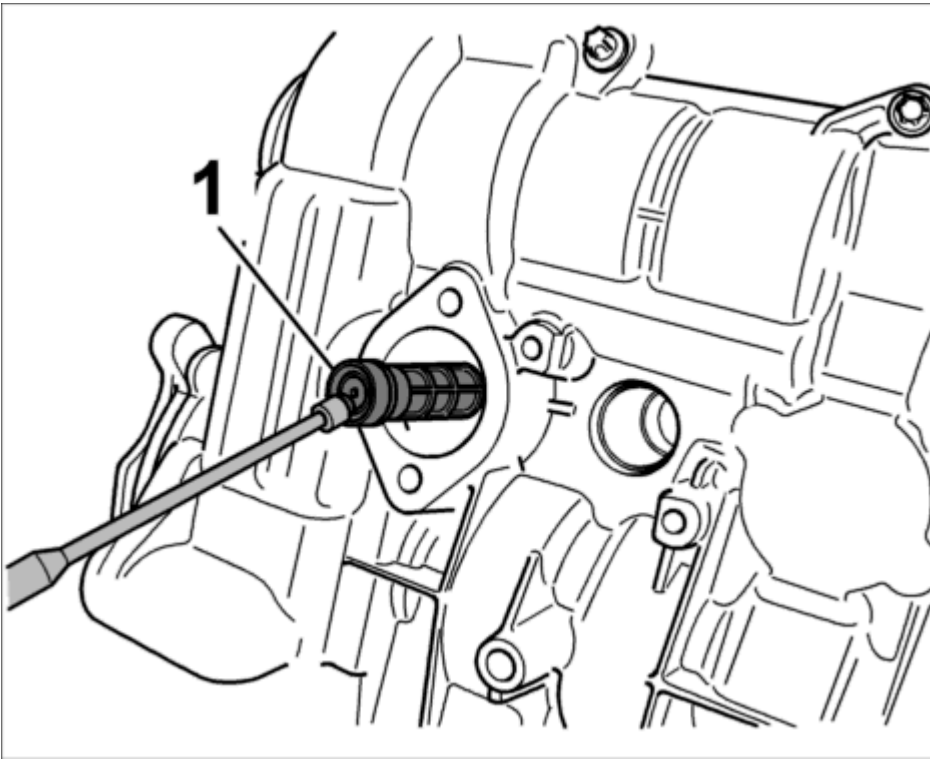


Fig. 212: Oil strainer in hydraulic valve for camshaft adjustment
Courtesy of PORSCHE OF NORTH AMERICA, INC.

4. If the solenoid hydraulic valve is removed for camshaft timing, the oil strainer -1- must be checked for damage and contamination, and replaced if necessary. See **Fig. 212**.

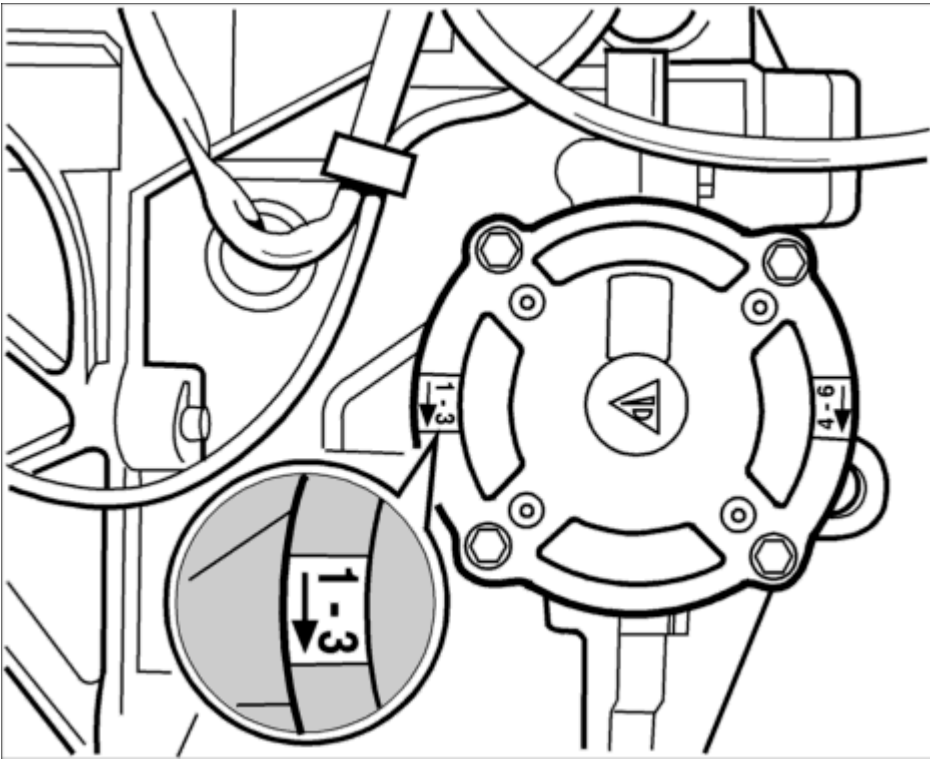


Fig. 213: Oil suction pump 1 - 3

Courtesy of PORSCHE OF NORTH AMERICA, INC.

5. Remove oil suction pump 1 - 3. Unscrew four M6 x 20 Torx screws (micro-self-locking), remove oil suction pump, replace O-ring and screws.
6. Unclip oxygen sensor line from the brackets.

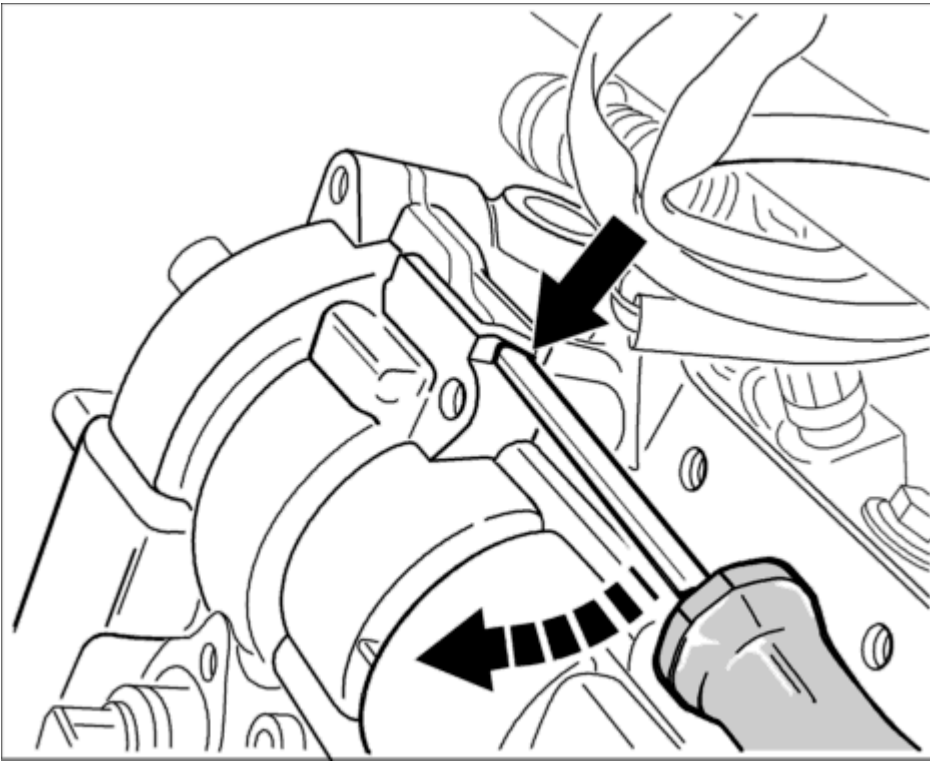


Fig. 214: Lifting cylinder head cover from above
Courtesy of PORSCHE OF NORTH AMERICA, INC.

CAUTION: Damage when levering off the cylinder head cover

- **Cast lugs could break.**

--> Perform work steps carefully and gently.

7. Remove the cylinder head cover. Unscrew 20 M6 x 30 Torx screws from the cylinder head cover. To loosen the cylinder head cover, raise the cover carefully at the two protruding cast edges with a screw driver or mounting lever. Remove cylinder head cover.

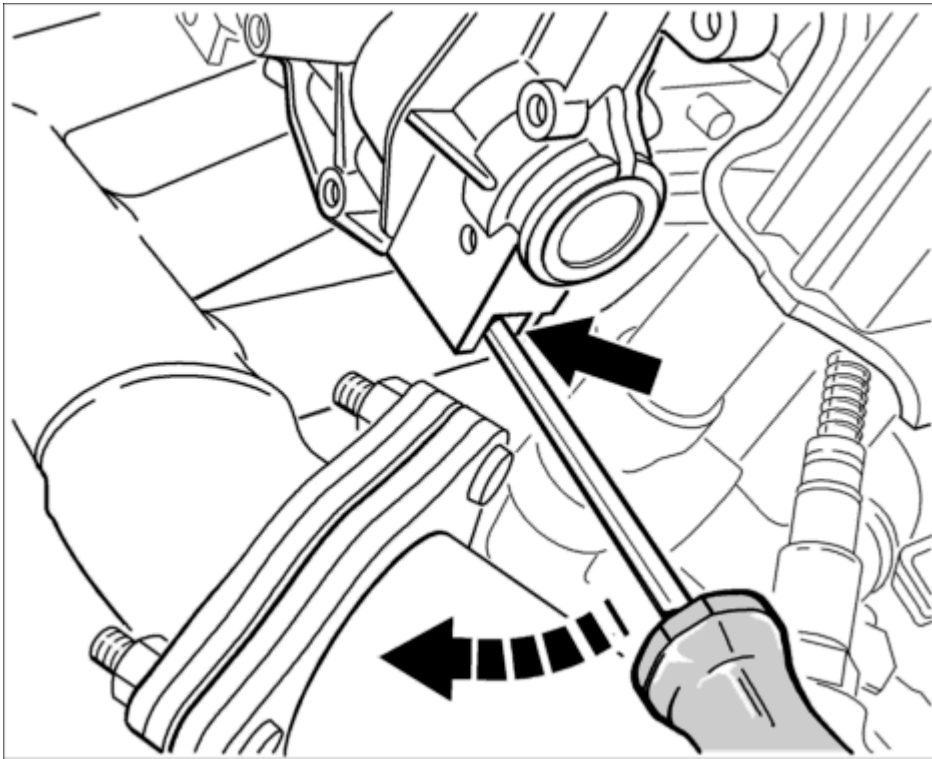


Fig. 215: Lifting cylinder head cover from below
Courtesy of PORSCHE OF NORTH AMERICA, INC.

8. Remove the plastic cap.

NOTE: **Make sure that it is cleaned thoroughly and that residual sealing compound is removed completely. Even the smallest particles can block up oil bores.**

9. Clean the sealing faces on the cylinder head cover and cylinder head thoroughly (use a brass or nylon brush, a clean and lint-free cloth soaked in acetone). All residual sealing compound in the cylinder head and on the cover must be removed before assembling.

Additional work steps on the cylinder row 4-6:

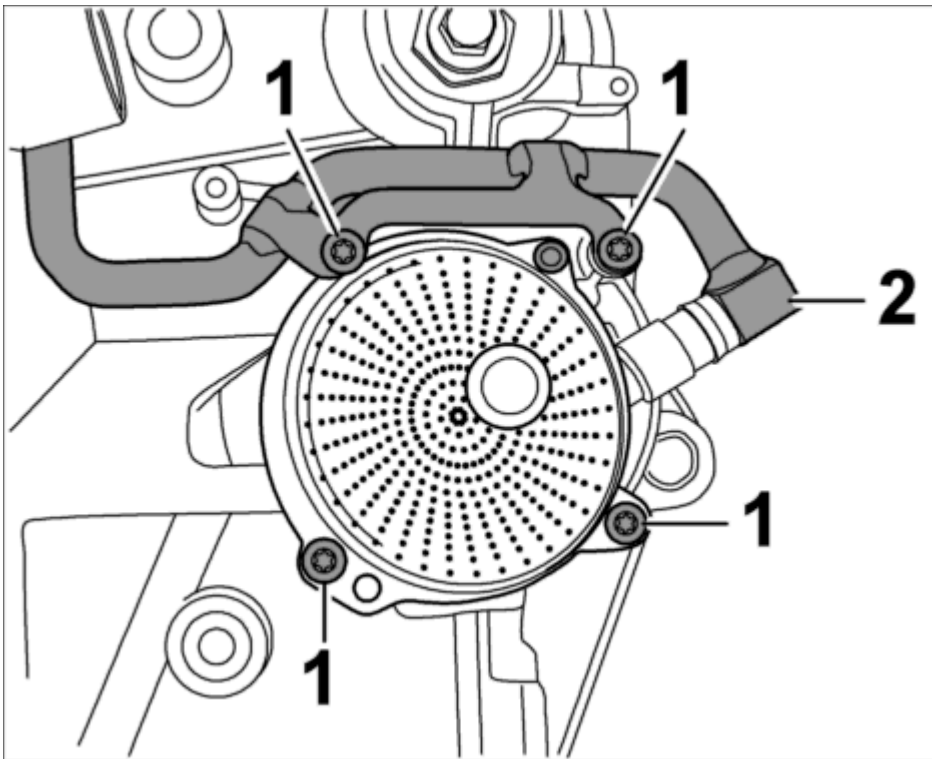


Fig. 216: Tandem pump side 4 - 6

Courtesy of PORSCHE OF NORTH AMERICA, INC.

- A tandem pump is installed on side 4-6 instead of the oil suction pump. Pull off the vacuum line on the pump - 2- . Replace O-rings and micro-self-locking screws -1- . See **Fig. 216**.

INSTALLING CYLINDER HEAD COVER - ENGINE REMOVED

Installing cylinder head cover M96/25 and M96/26

CAUTION: Risk of damage due to particles of dirt.

- Oil bores/oil ducts can become blocked up.

--> When working on the engine, absolute cleanliness is essential.

--> Lay removed engine parts on a clean base and cover them without fail.

--> Use the **cover for dust protection when fitting the engine NR.165** on the engine assembly support.

NOTE: The coated screws for the bearing surfaces of the camshaft in the cylinder head cover must be replaced when installing.

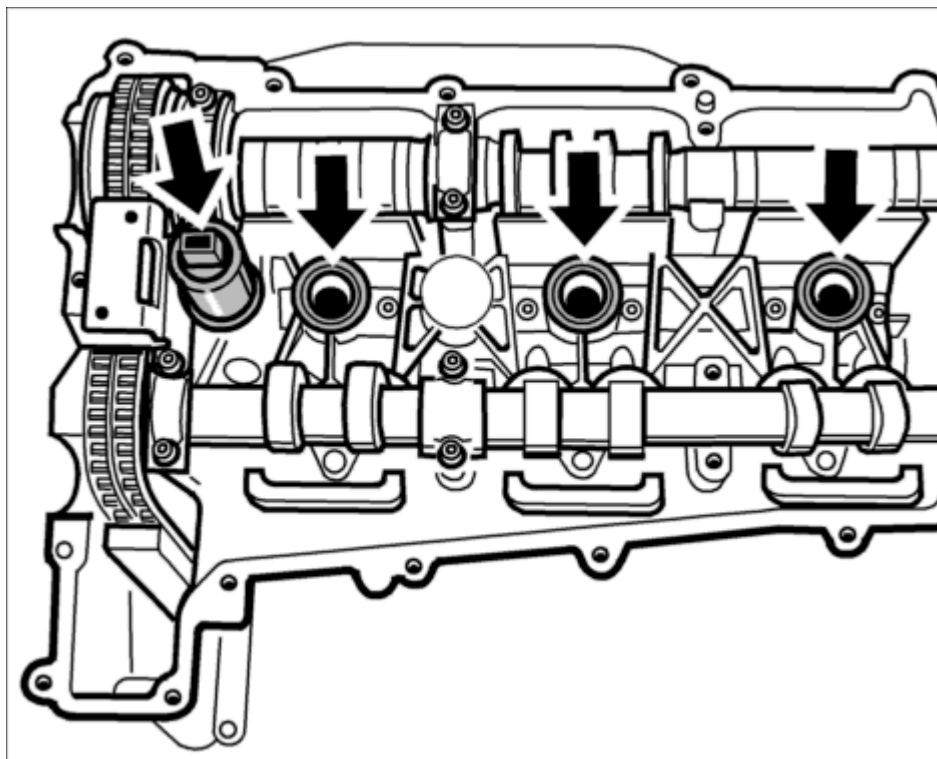


Fig. 217: Spark plug slot seals and solenoid hydraulic valves

Courtesy of PORSCHE OF NORTH AMERICA, INC.

1. Insert three new seals for the spark-plug recesses.

Only the following sealants may be used to seal the cylinder head cover:

- "Drei Bond" silicone - type 1209
- Loctite 5900

2. Prepare cylinder head cover for assembly. Apply a thin bead of sealant on the cylinder head cover (not higher than 1.5 mm). --> *Sealant application cylinder head cover* . See **Fig. 218**.

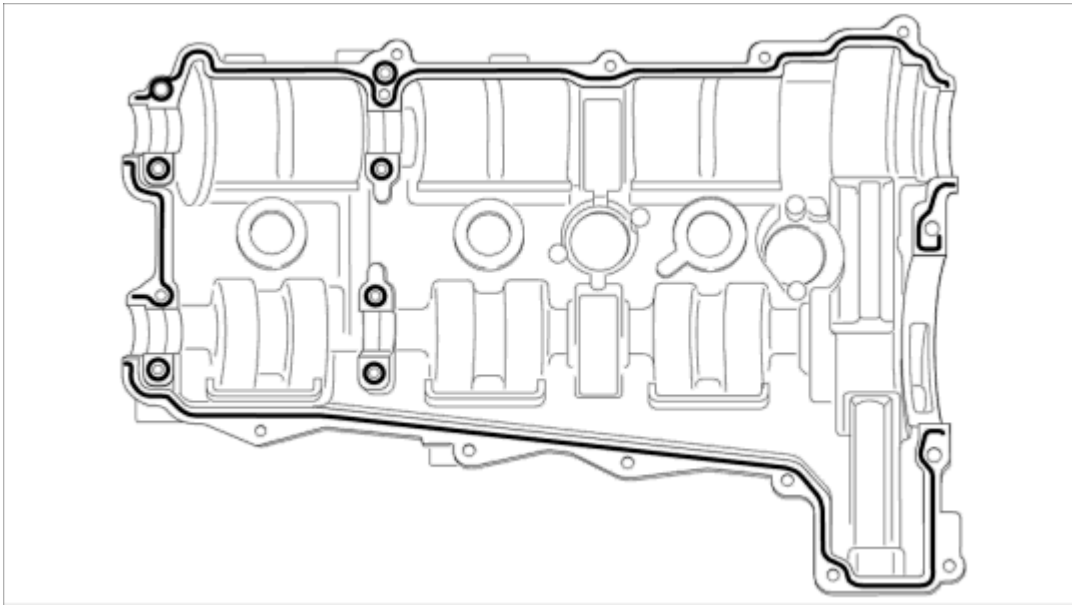


Fig. 218: Sealant application cylinder head cover
Courtesy of PORSCHE OF NORTH AMERICA, INC.

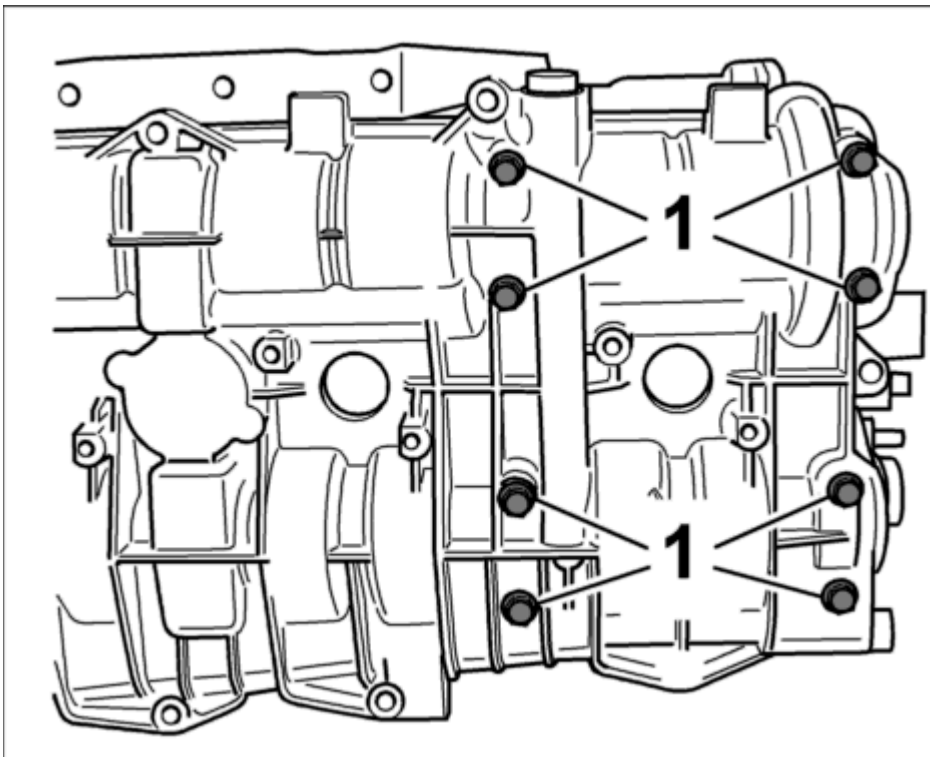


Fig. 219: Screws for camshaft bearing surface
Courtesy of PORSCHE OF NORTH AMERICA, INC.

3. Coated screws on the camshaft bearing surfaces -1- must be replaced. See **Fig. 219**.
4. Place the cylinder head cover carefully onto the cylinder head. The bead of sealing compound must not be

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ENGINE Cylinder head, valve drive - Boxster And Cayman

wiped off or broken.

5. Position 20 Torx screws (eight of these should be new, coated screws **-Item 1-4 and 7-10-**) on the cylinder head cover and tighten according to the specified tightening sequence. Only lightly screw in the two screws in the area of the oil suction pump/tandem pump. They will be tightened after the pump is assembled. -->

Tightening torque: 13 (9.5 ftlb.) Nm . See Fig. 220.

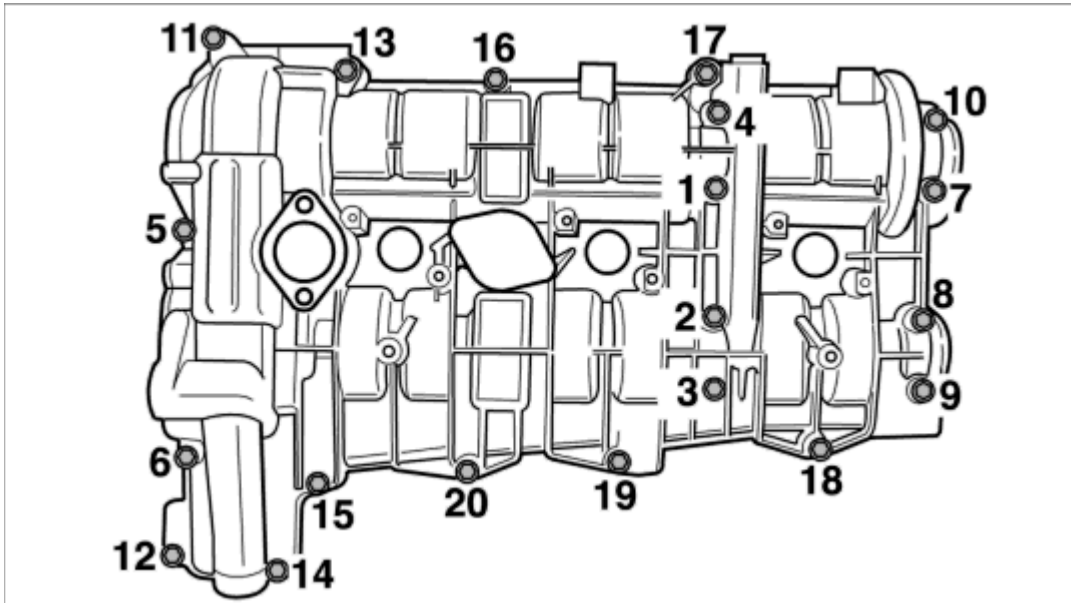


Fig. 220: Tightening sequence, cylinder head cover

Courtesy of PORSCHE OF NORTH AMERICA, INC.

6. Position a new cap \varnothing 45 mm (brown) on the bore of the intake camshaft on the pulley side and tap it gently into place with a plastic hammer (dry mount).

7. Insert two new caps (green) into the small bores on the clutch side. Tap it in with a plastic hammer (dry mount).

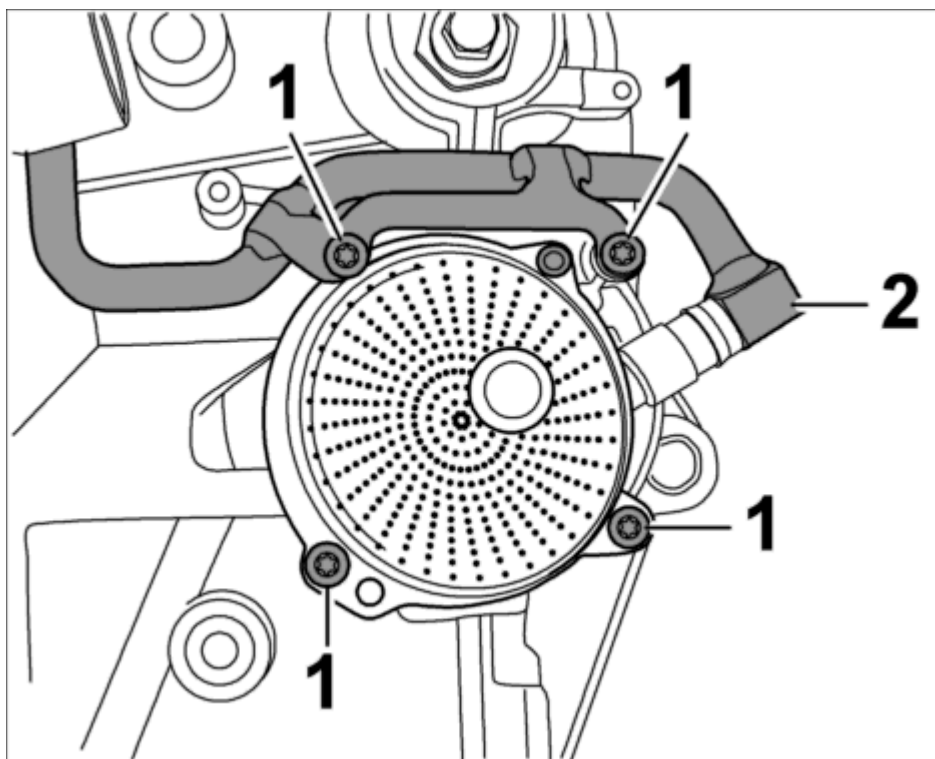


Fig. 221: Tandem pump side 4 - 6

Courtesy of PORSCHE OF NORTH AMERICA, INC.

NOTE: Replace O-ring on the oil suction pump (or tandem pump).

8. Mount the oil suction pump or tandem pump with four new, micro-self-locking Torx screws **-1-** . Replace O-rings on the pumps and the vacuum line **-2-** . Lightly grease O-rings with Optimol MP3. --> **Tightening torque: 10 (7.5 ftlb.) Nm** . See **Fig. 221**.

9. Tighten the two screws on cylinder head cover in area of oil suction pump/tandem pump. --> **Tightening torque: 13 (9.5 ftlb.) Nm**

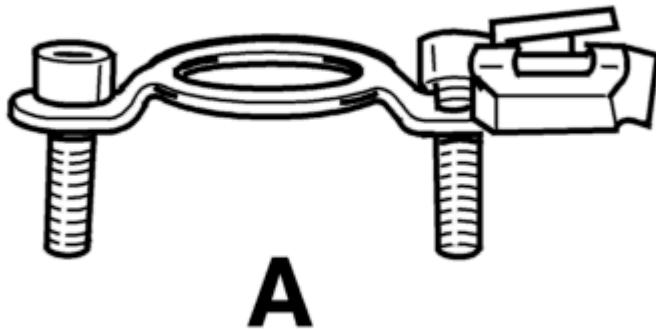


Fig. 222: Holder for solenoid hydraulic valves

Courtesy of PORSCHE OF NORTH AMERICA, INC.

10. Push on new retainer plates (with integrated seal) onto solenoid hydraulic valves. Position support and tighten with two Torx screws (M6 x 20). --> **Tightening torque: 10 (7.5 ftlb.) Nm**

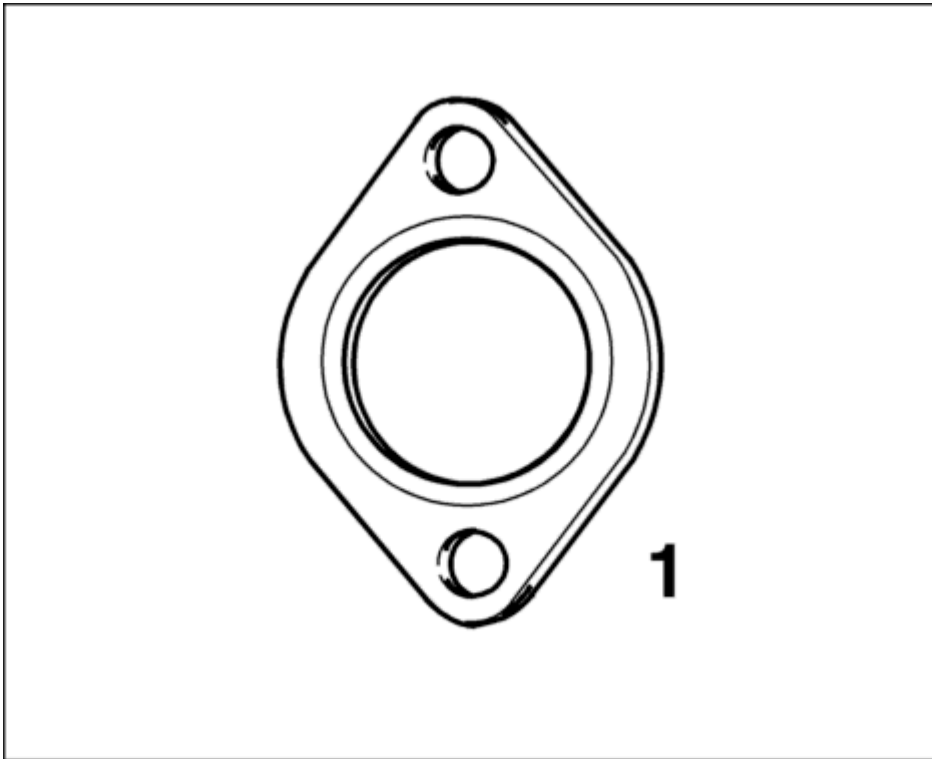


Fig. 223: Installation position for solenoid hydraulic valve retainer plates
Courtesy of PORSCHE OF NORTH AMERICA, INC.

11. Insert ignition coils into the spark-plug recesses. Position and tighten two M6 x 25 Torx screws per ignition coil. --> **Tightening torque: 10 (7.5 ftlb.) Nm**
12. Plug in cable plugs for ignition coils and solenoid hydraulic valves. Clip the cables of the hydraulic valves into the brackets.
13. Connect cable plug to oil temperature switch.
14. Clip oxygen sensor lines into brackets.

SUBSEQUENT WORK

Subsequent work


1. Install engine. Refer to **10 01 19 Removing and installing engine - as of MY 2005 (Boxster, Boxster RHD, Boxster S, Boxster S RHD) .**

15 84 19 REMOVING AND INSTALLING ACTUATOR FOR INLET CAMSHAFT - AS OF MY 2005 (BOXSTER, BOXSTER RHD, BOXSTER S, BOXSTER S RHD)

TOOLS

2007 Porsche Boxster

ENGINE Cylinder head, valve drive - Boxster And Cayman

Designation	Type	Number	Explanation	
pliers for circlips	commercially available tool	NR.70		

REMOVING ACTUATOR - CAMSHAFT REMOVED

Removing actuator - camshaft removed

NOTE:

- *During assembly and disassembly, absolute cleanliness is essential!*
- *The identification on the bearing sleeve should point towards the camshaft (see illustration).*

Component overview of inlet camshaft

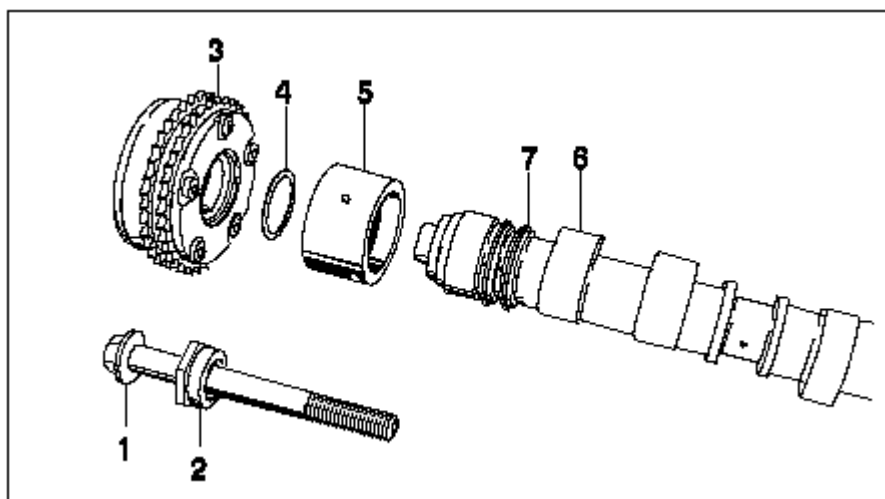


Fig. 224: Component overview of inlet camshaft

Courtesy of PORSCHE OF NORTH AMERICA, INC.

Item	Designation	Qty.	Removal	Fitting
1	Central screw	1		Replace
2	Adapter	1		
3	Camshaft adjustment device	1		
4	Friction washer	1		Replace
5	Bearing sleeve	1		Pay attention to the installation position!
6	Inlet camshaft	1	Check for visible signs of wear, taking care not to damage rotor trim	replace if necessary
	Plain compression			

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ENGINE Cylinder head, valve drive - Boxster And Cayman

7	rings	2	Check for visible signs of wear	replace if necessary
---	-------	---	---------------------------------	----------------------

1. Unscrew central screw -1- with adapter -2- .
2. Remove camshaft adjustment device -3- .
3. Remove washer -4- .
4. Pull bearing sleeve -5- carefully off the camshaft -6- .

NOTE:

- ***Carry out disassembly and assembly of the plain compression rings carefully and gently.***

5. Check plain compression rings -7- for visible and perceptible signs of wear; replace if necessary. To remove and install, use snap-ring pliers, e. g. **pliers for circlips NR.70**.
6. Check plain compression rings for visible and perceptible signs of wear; replace if necessary.

INSTALLING ACTUATOR - CAMSHAFT REMOVED

Installing actuator - camshaft removed

NOTE:

- ***During assembly and disassembly, absolute cleanliness is essential!***
- ***The identification on the bearing sleeve should point towards the camshaft (see illustration).***

Assemble inlet camshaft before inserting in cylinder head.

NOTE:

- ***Carry out disassembly and assembly of the plain compression rings carefully and gently.***

1. Insert plain compression rings (if removed) carefully into the ring grooves. To remove and install, use snap-ring pliers, e. g. **pliers for circlips NR.70**.

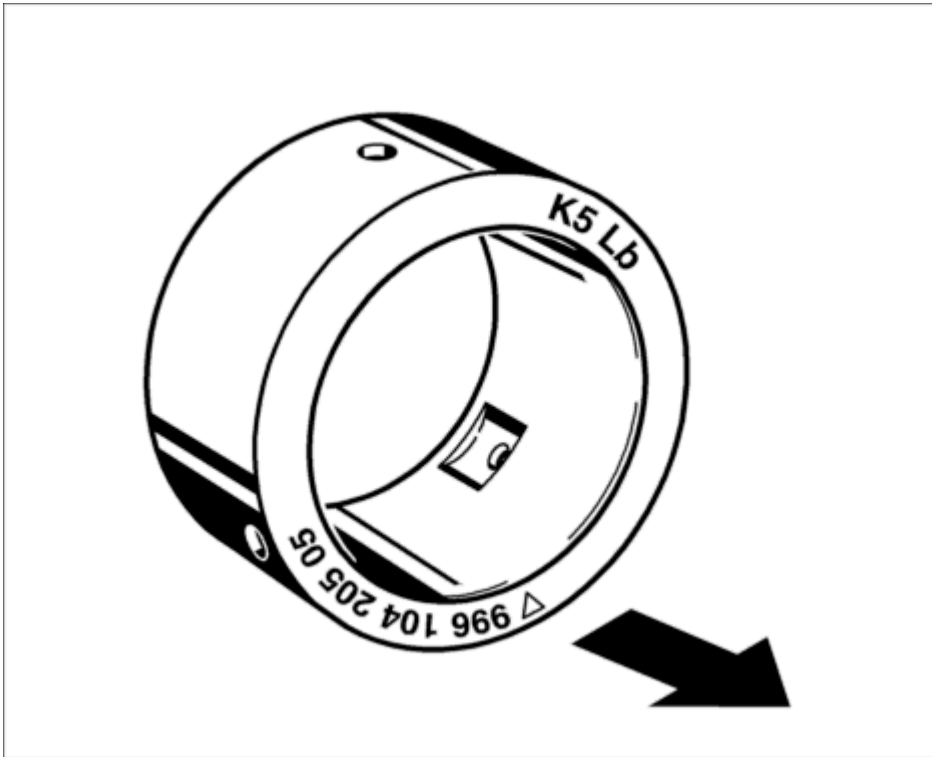


Fig. 225: Direction of installation of bearing sleeve - identification towards camshaft
Courtesy of PORSCHE OF NORTH AMERICA, INC.

2. Install bearing sleeve: lightly oil running surface with new engine oil. Press together the first piston ring and carefully push up the bearing sleeve. Proceed in the same way with the second piston ring. Pay attention to direction of installation.

NOTE:

- ***Make sure that the new friction washer is inserted.***

3. Position new friction washer and place the camshaft adjustment device in position. Insert the central screw with the adapter and tighten gently by hand.