

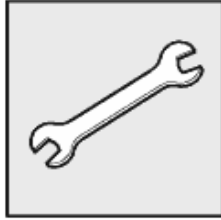
Pack list

1. 1 1/16 wrench
2. 1 1/16 socket
3. T-55 tox bit
4. 8 pc metric allen wrench set
5. 2 sets cam fixture blocks
6. Vanos socket
7. Straight crank lock pin
8. Short crank lock pin
9. Timing tensioning block (red)
10. Timing tensioner bolt
11. L & R Timing disc brackets w/ pins
12. Vanos adjustment socket
13. 2 springs (not needed)
14. Timing pulley fixture(remove large crank pulley bolt)
15. Instructions
16. Inch pound torque driver
17. Flexible extension

9/98-03 m62 vanos timing chain guide replacement parts list

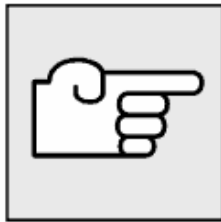
Qty	Part Number	description	ave price	dealer only	required?	best to change now?
1	11141741532	Profile gasket, cyl 1-4	5.83		Yes	yes
1	11141741533	Profile gasket, cyl 5-8	6.14		Yes	yes
1	11141736758	gasket ring		yes	no	yes, sometimes reuseable
1	11141436978	GASKET SET CHAIN CASE	14.05		Yes	yes
1	11141275466	Shaft seal	11.16		no	yes, sometimes reuseable
1	11131436324	lower oil pan gasket	21.67		no	yes, sometimes reuseable
1	12611744292	oil level sensor unit o-ring	4.36		no	yes, sometimes reuseable
1	11151705272	oil separator	32.63		no	yes, sometimes reuseable
1	11120034104	valve cover gaskets, cyl 1-4	21.64		no	yes, sometimes reuseable
1	11120034105	valve cover gaskets, cyl 5-8	21.61		no	yes, sometimes reuseable
1	11311741746	timing chain	81.61		no	yes, sometimes reuseable
1	11311741777	deflection rail	109.13		yes	yes
1	11311745406	guide rail	32.11		Yes	yes
1	11311741236	timing chain tensioner rail	94.93		Yes	yes
1	7119963355	sealing washer		yes	no	yes, sometimes reuseable
1	11511731372	water pump gasket	2.84		Yes	yes
1	11317531813	timing chain tensioner	59.51		no	yes, sometimes reuseable

13AZ Left-hand thread: Exhaust chain wheel to exhaust camshaft	M62 / VANOS	M12x1.5	125 Nm
14AZ Left-hand thread: VANOS adjustment unit to inlet camshaft	M62 / VANOS	M12x1.5	110 Nm
15AZ Left-hand thread: Nut of sensor gear screw fitting	M62 / VANOS	M18x1.5	40 Nm

**Special tools required:**

- 00 9 250
- 11 2 300
- 11 2 441
- 11 2 442
- 11 2 443
- 11 2 444
- 11 2 445
- 11 2 446
- 11 4 230
- 11 4 231
- 11 4 232
- 11 5 180
- 11 6 440
- 11 6 450
- 11 6 451
- 11 6 452
- 11 7 380

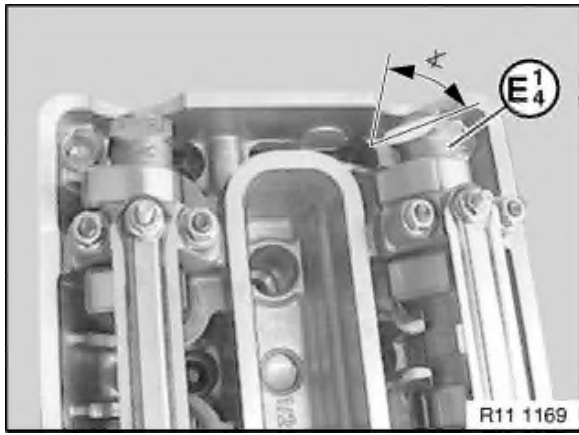
Remove intake filter housing with air-mass flow sensor.



Remove fan impeller with fan clutch and fan cowl.

Remove both cylinder head covers.

Remove spark plugs.

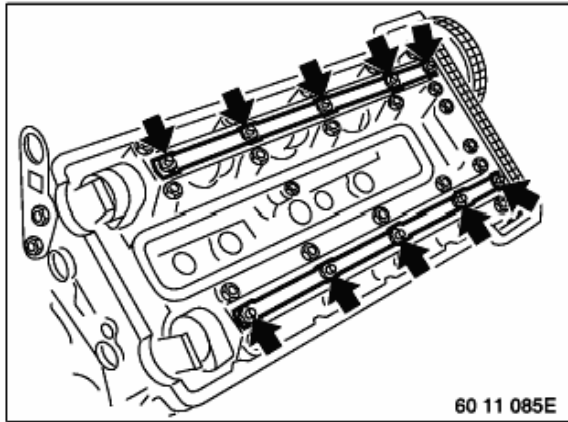


Note:

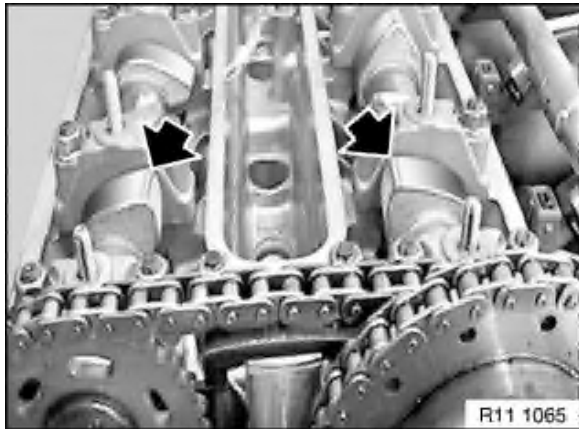
In firing TDC position, the inlet camshaft 1 to 4 rotates in the teeth of the camshaft adjustment unit.

Caution!

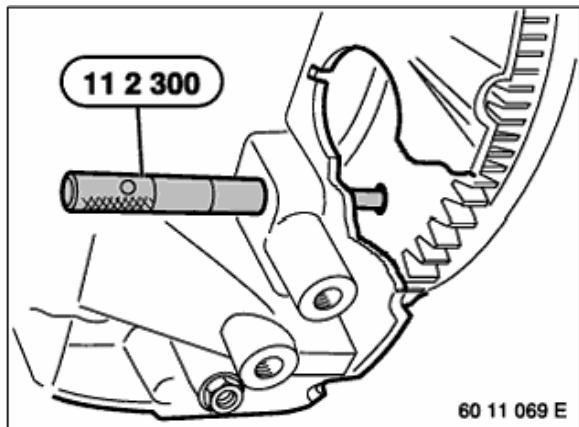
This twisting is caused by the position of the cams and is not an indication for incorrect timing.



Remove oil lines on left and right of cylinder head.



Turn engine in direction of rotation as far as TDC firing position of first cylinder.

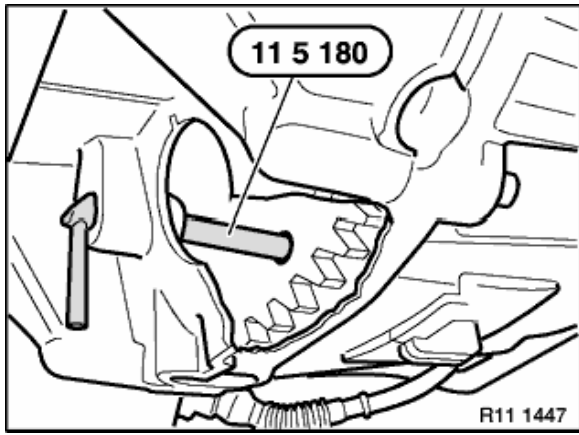


E38/E39

Secure crankshaft with special tool 11 2 300 in TDC firing position of first cylinder.

Caution!

Remove special tool 11 2 300 before starting engine.

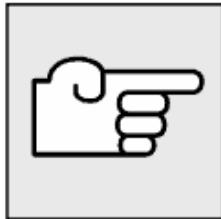


E53 (X5)

Secure crankshaft with special tool 11 5 180 in TDC firing position of first cylinder.

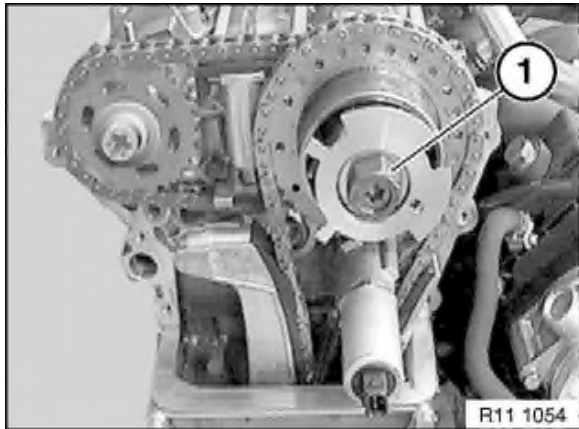
Caution!

Remove special tool 11 5 180 before starting engine.



Remove chain tensioning piston.

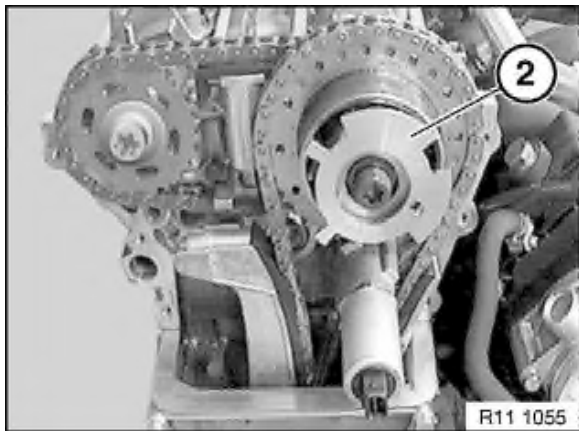
Remove both timing case covers at top.



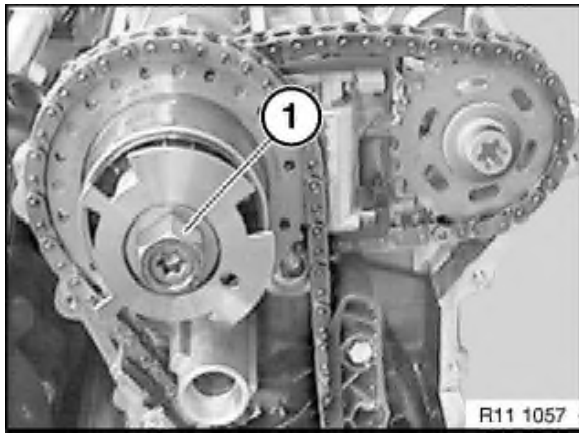
Caution!

Left-hand threads.

Release nut (1) on sensor gear screw connection on cylinder bank 1 to 4.



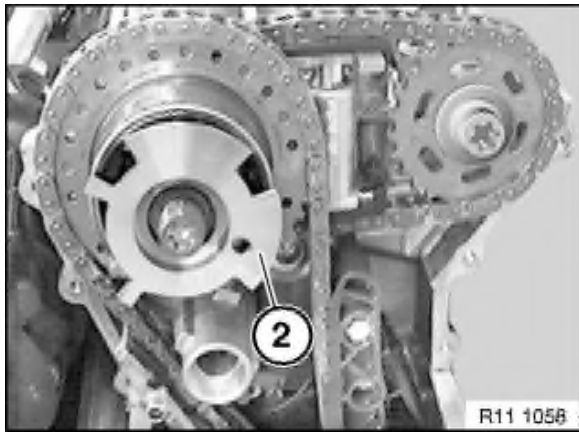
Remove sensor gear (2) on cylinder bank 1 to 4.



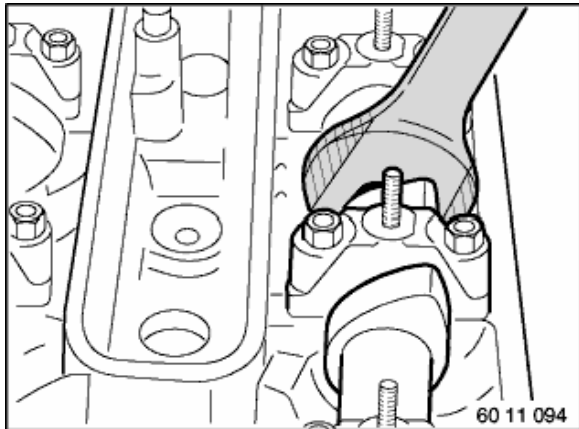
Caution!

Left-hand threads.

Release nut (1) on sensor gear screw connection on cylinder bank 5 to 8.



Remove sensor gear (2) on cylinder bank 5 to 8.

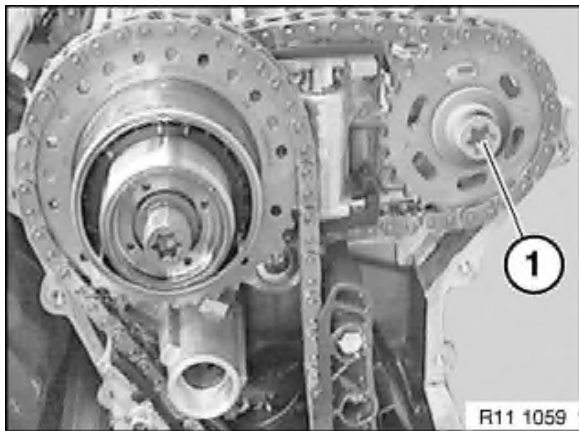


Caution!

Do not damage the cylinder head.

If necessary, machine open-end wrench accordingly.

When releasing camshaft screw connection: grip camshaft at hexagon head.

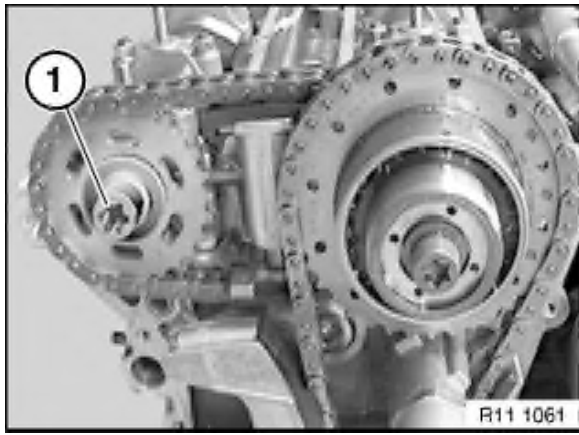


Caution!

Left-hand threads.

When releasing camshaft screw connection: grip camshaft at hexagon head.

Slacken screw connection (1) of exhaust camshaft on cylinder bank 5 to 8 by approx. a half turn.

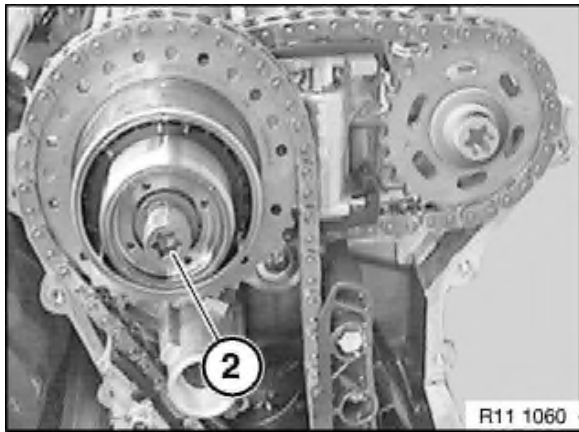


Caution!

Left-hand threads.

When releasing camshaft screw connection: grip camshaft at hexagon head.

Slacken screw connection (1) of exhaust camshaft on cylinder bank 1 to 4 by approx. a half turn.

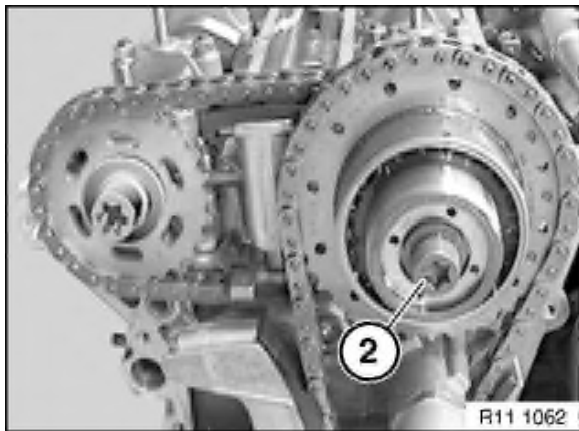


Caution!

Left-hand threads.

When releasing camshaft screw connection: grip camshaft at hexagon head.

Slacken screw connection (2) of inlet camshaft on cylinder bank 5 to 8 by approx. a half turn.

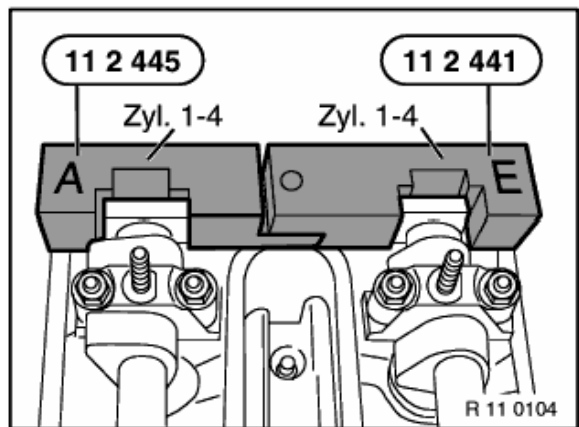


Caution!

Left-hand threads.

When releasing camshaft screw connection: grip camshaft at hexagon head.

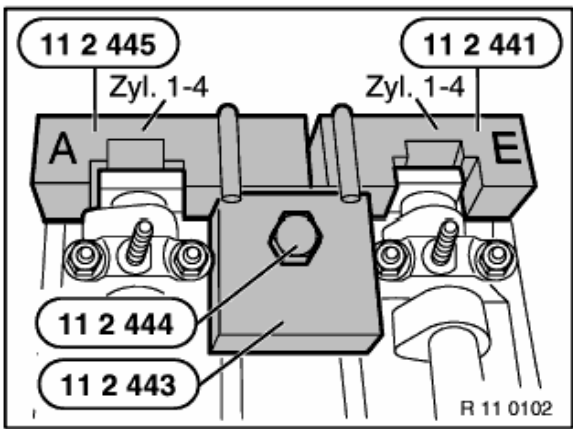
Slacken screw connection (2) of inlet camshaft on cylinder bank 1 to 4 by approx. a half turn.



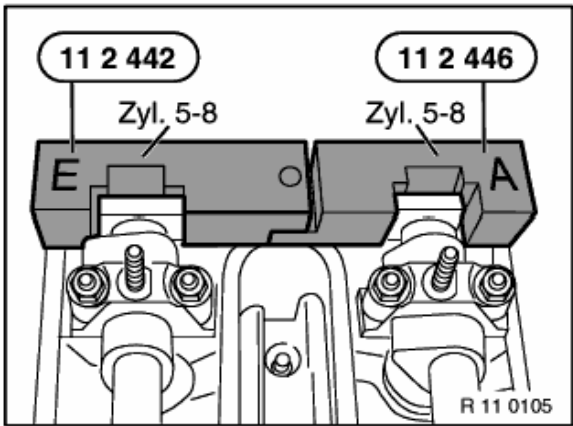
Align camshafts.

Attach special tool 11 2 445 / 11 2 441 to camshafts, cylinder bank 1 to 4.

leave screw on fixture loose until both pieces are on cams. use 1/16 wrench to wiggle cams to get them to go into fixture. cams have "A" and "E" cast into them on the side of the cam square that faces up in the fixture. after fixture is on both cams, tighten screw in fixture with allen wrench. use rubber mallet to seat bottom of fixture to top of head. Double check to make sure fixtures on both sides are flat on head surface. DO THIS ON BOTH SIDES

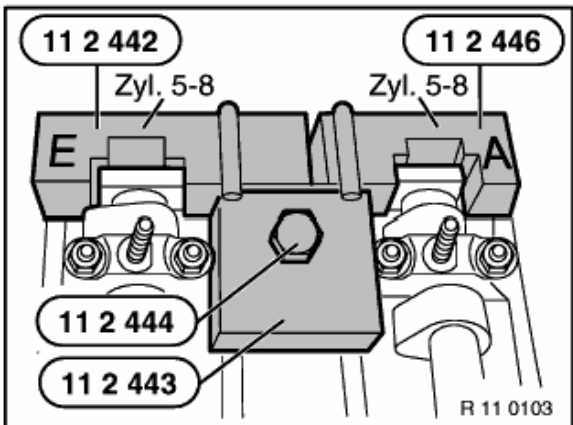


Attach special tool 11 2 443 to special tool 11 2 445 / 11 2 441 and secure with special tool 11 2 444 via spark plug thread.

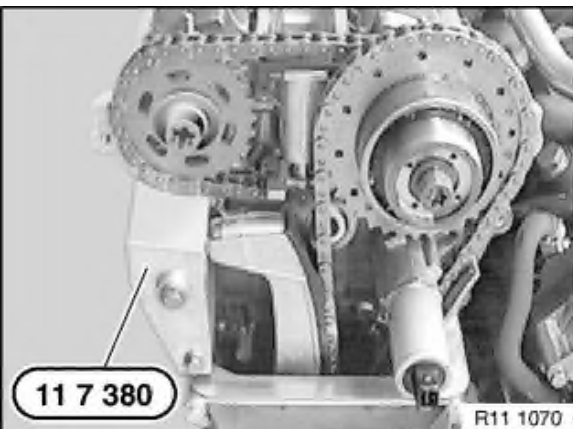


Align camshafts.

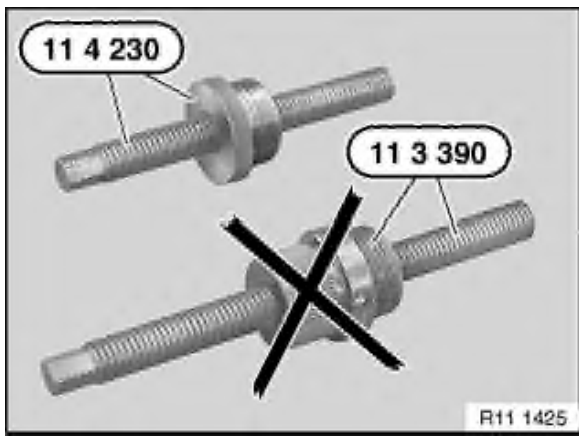
Attach special tool 11 2 446 / 11 2 442 to camshafts, cylinder bank 5 to 8.



Attach special tool 11 2 443 to special tool 11 2 446 / 11 2 442 and secure with special tool 11 2 444 via spark plug thread.



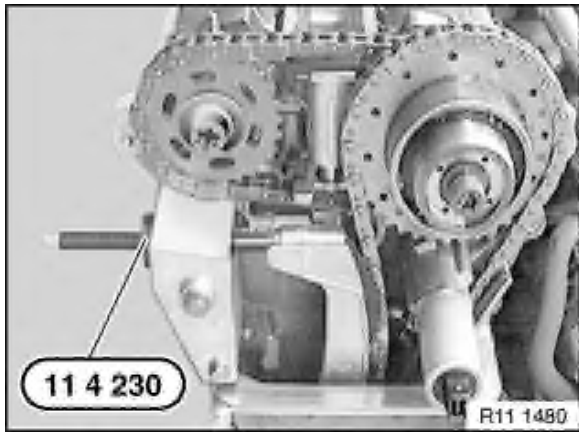
Fit special tool 11 7 380 to right cylinder head on cylinder bank 1 to 4.



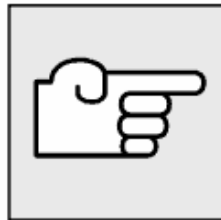
Note:

The special tool kit 11 3 390 can no longer be fitted in the E53 (X5) with M62 engine due to the altered space conditions. With the market launch of the E53 (X5) with M62 engine, the special tool kit 11 3 390 is dropped.

The shorter special tool kit 11 4 230 comprising special tools 11 4 231 and 11 4 232 replaces the special tool kit 11 3 390.



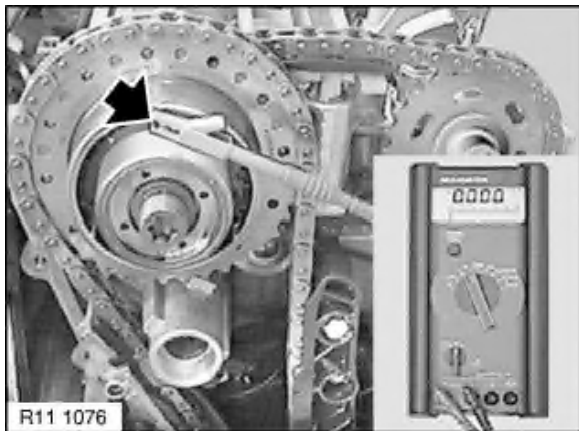
Insert special tool kit 11 4 230 in special tool 11 7 380 .
Screw in adjustment screw on tensioning rail, but do not tighten yet.



Note:

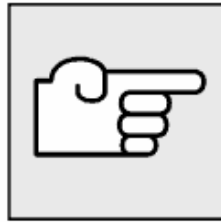
The continuity test with the multimeter described in the following is not possible on the M62 B46 because of the different design of the camshaft adjustment unit.

The remaining procedure is identical.



Connect a commercially available multimeter to a contact pin on camshaft adjustment unit and to the screw connection on oil line on cylinder bank 5 to 8.

Set multimeter to acoustic continuity test.



Attach special tool 11 6 440 to camshaft adjustment unit on cylinder bank 5 to 8 and move at 40 Nm to left-hand stop.

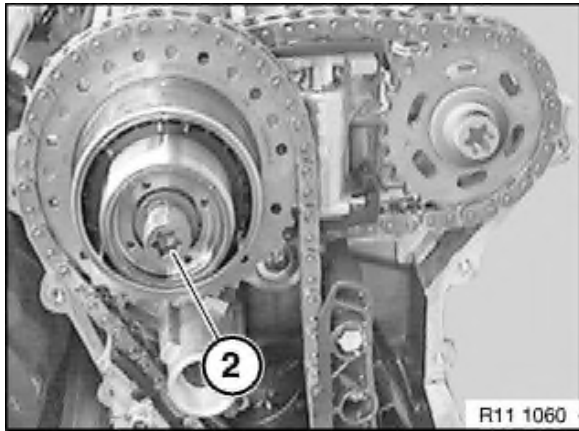
Check left-hand stop of camshaft adjustment unit with acoustic continuity test on multimeter.

Note:

Rotating the camshaft adjustment unit at 40 Nm to the left-hand stop ensures that the end position is reached and there is no longer an "oil cushion" before the left-hand stop of the camshaft adjustment unit.

In the camshaft adjustment unit, there are three contacts which are closed when the unit is at the left-hand stop.

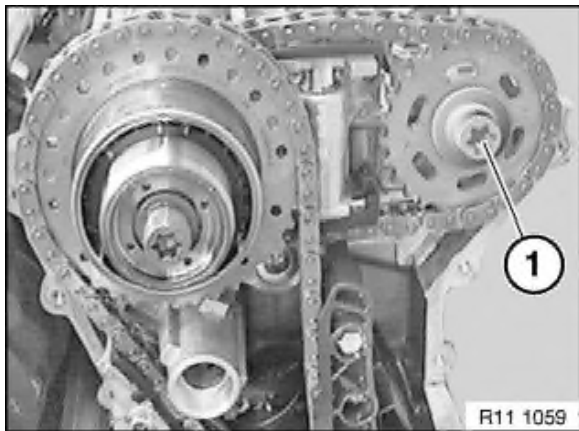
During the acoustic continuity test with the multimeter, a sound signal can be heard when the camshaft adjustment unit is at the left-hand stop.



Caution!

Left-hand threads.

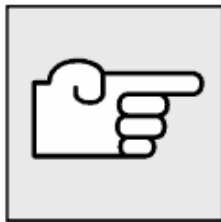
Tighten screw connection (2) of inlet camshaft on cylinder bank 5 to 8 to an initial torque of 15 Nm and then slacken off again by a 1/4 turn.



Caution!

Left-hand threads.

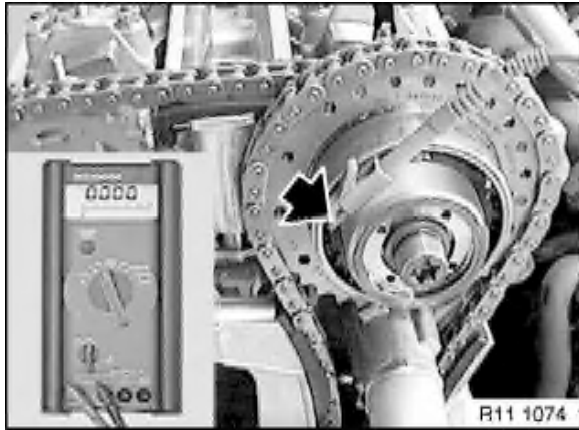
Tighten screw connection (1) of exhaust camshaft on cylinder bank 5 to 8 to an initial torque of 15 Nm and then slacken off again by a 1/4 turn.



Note:

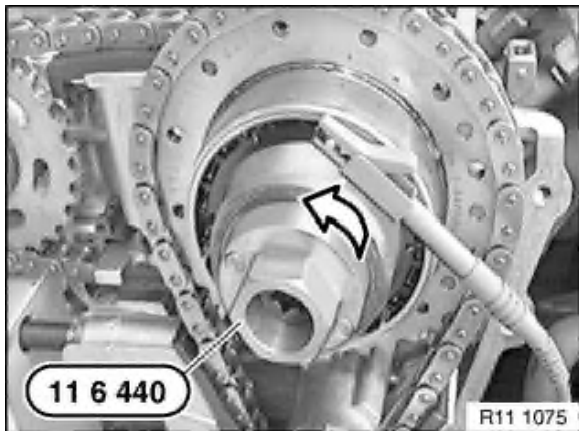
The continuity test with the multimeter described in the following is not possible on the M62 B46 because of the different design of the camshaft adjustment unit.

The remaining procedure is identical.



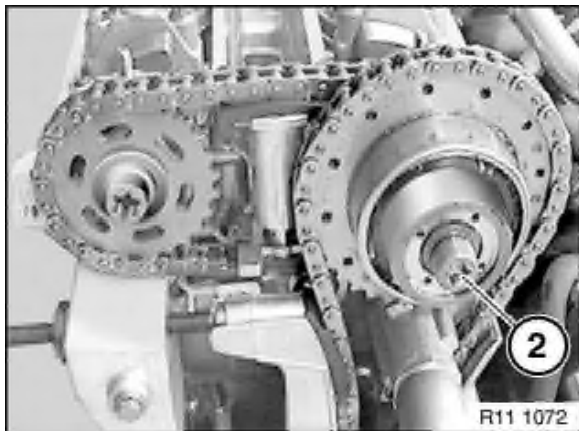
Connect a commercially available multimeter to a contact pin on camshaft adjustment unit and to the screw connection on oil line on cylinder bank 1 to 4.

Set multimeter to acoustic continuity test.



Attach special tool 11 6 440 to camshaft adjustment unit on cylinder bank 1 to 4 and move at 40 Nm to left-hand stop.

Check left-hand stop of camshaft adjustment unit with acoustic continuity test on multimeter.



Caution!

Left-hand threads.

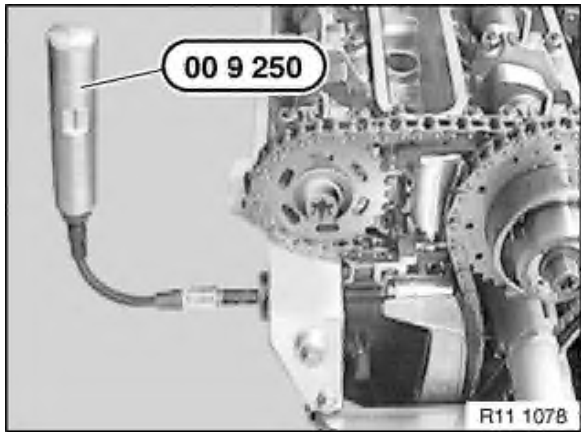
Tighten screw connection (2) of inlet camshaft on cylinder bank 1 to 4 to an initial torque of 15 Nm and then slacken off again by a 1/4 turn.



Caution!

Left-hand threads.

Tighten screw connection (1) of exhaust camshaft on cylinder bank 1 to 4 to an initial torque of 15 Nm and then slacken off again by a 1/4 turn.



Pretension tensioning rail by turning adjusting screw on special tool 11 4 230 with special tool 00 9 250 to 0.7 Nm.

Note:

If installation tolerance is unfavorable, attach special tool 00 9 250 from underside.

use screw driver torque tool and tighten to 6 inch lbs.

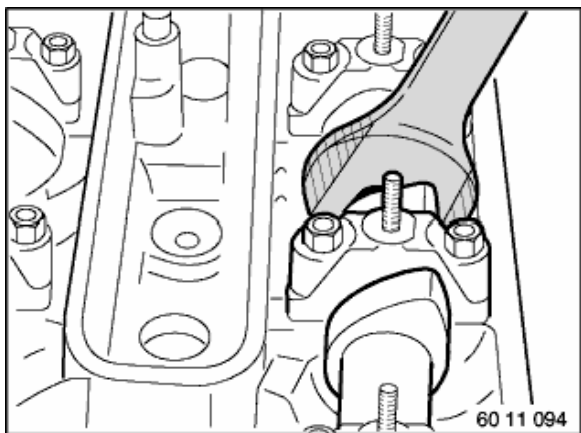


Note:

Pretensioning the timing chain moves the camshaft adjustment unit and the unit must therefore be reset to the left-hand stop.

Attach special tool 11 6 440 to camshaft adjustment unit on cylinder bank 5 to 8 and move at 40 Nm to left-hand stop.

Check left-hand stop of camshaft adjustment unit with acoustic continuity test on multimeter.

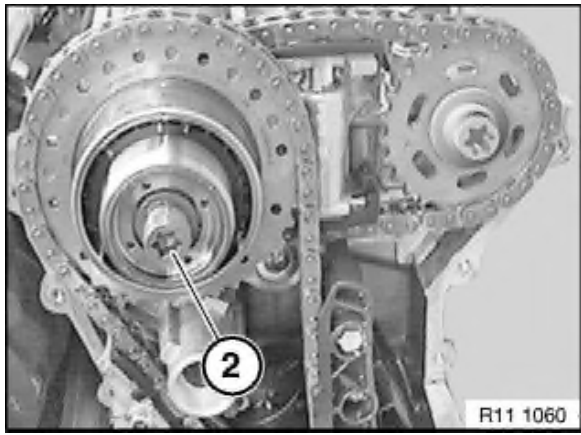


Caution!

Do not damage the cylinder head.

If necessary, machine open-end wrench accordingly.

When tightening down camshaft screw connection: grip camshaft at hexagon head.

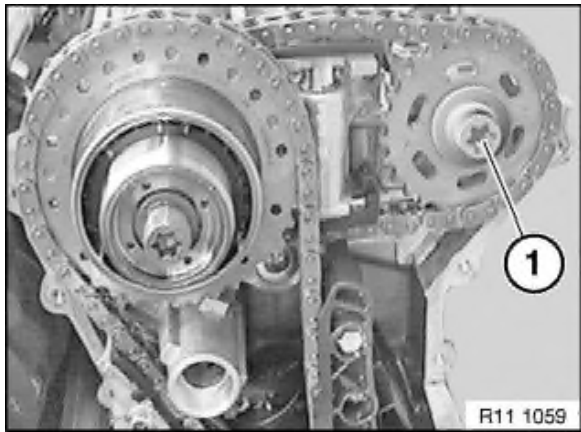


Caution!

Left-hand threads.

Tighten down screw connection (2) of inlet camshaft on cylinder bank 5 to 8.

Tightening torque, 11 36 14AZ



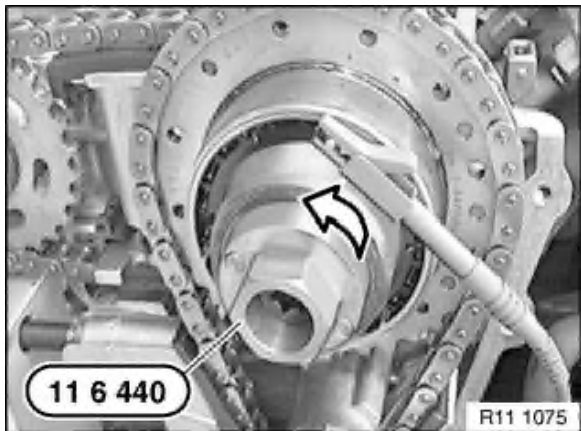
Caution!

Left-hand threads.

When tightening down camshaft screw connection: grip camshaft at hexagon head.

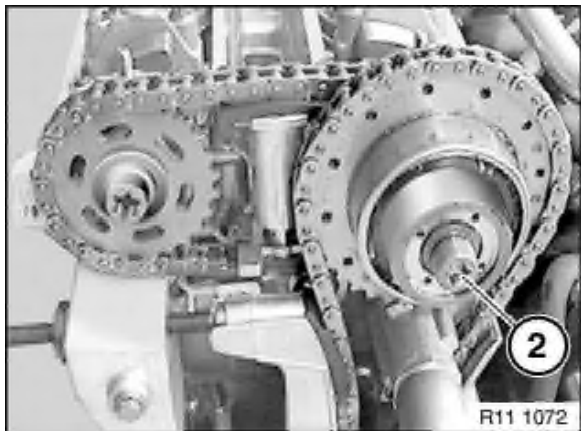
Tighten down screw connection (1) of exhaust camshaft on cylinder bank 5 to 8.

Tightening torque, 11 36 13AZ



Attach special tool 11 6 440 to camshaft adjustment unit on cylinder bank 1 to 4 and move at 40 Nm to left-hand stop.

Check left-hand stop of camshaft adjustment unit with acoustic continuity test on multimeter.



Caution!

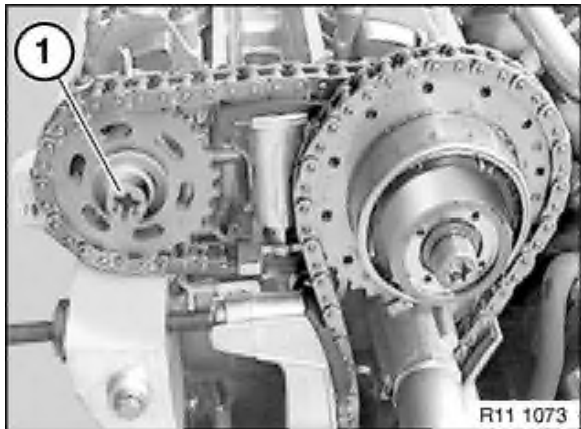
Left-hand threads.

When tightening down camshaft screw connection: grip camshaft at hexagon head.

Tighten down screw connection (2) of inlet camshaft on cylinder bank 1 to 4.

Tightening torque, 11 36 14AZ





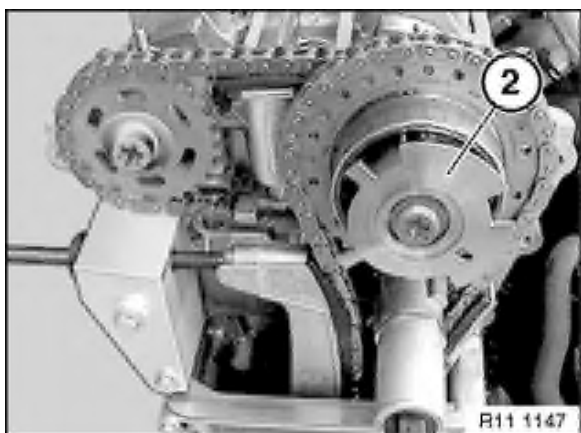
Caution!

Left-hand threads.

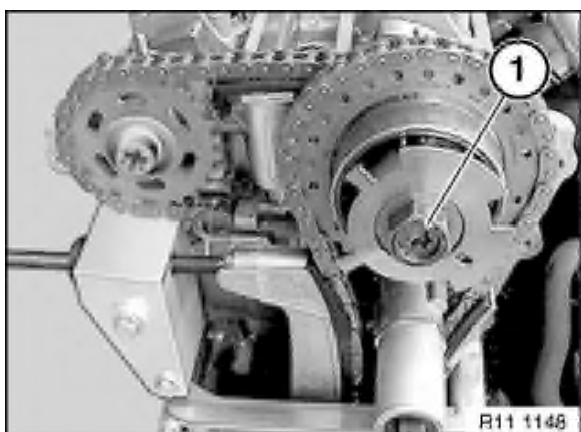
When tightening down camshaft screw connection: grip camshaft at hexagon head.

Tighten down screw connection (1) of exhaust camshaft on cylinder bank 1 to 4.

Tightening torque, 11 36 13AZ



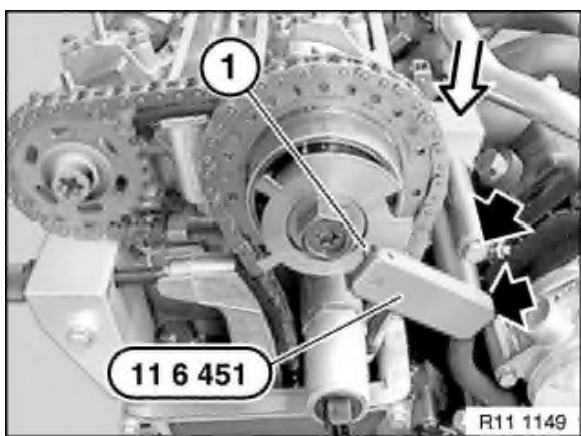
Attach sensor gear (2) to cylinder bank 1 to 4.



Caution!

Left-hand threads.

Fit nut (1) of sensor gear screw connection on cylinder bank 1 to 4 and initially tighten without play, but do not tighten down yet.



Note:

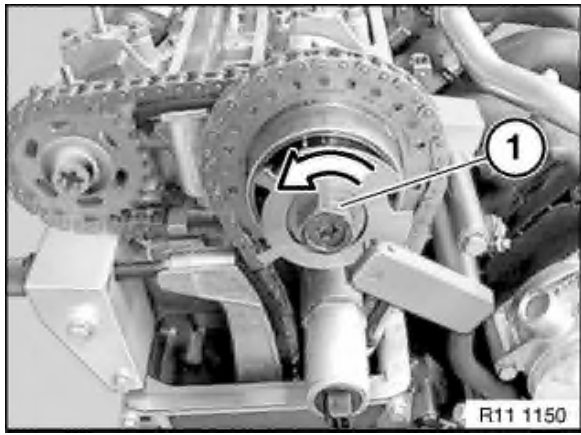
Special tool kit 11 6 450 comprises:

Special tool 11 6 451 for cylinder bank 1 to 4

Special tool 11 6 452 for cylinder bank 5 to 8

Align locating bore (1) on sensor gear of cylinder bank 1 to 4 to positioning pin on special tool 11 6 451. Fit special tool 11 6 451, insert screws and initially tighten without play. Press special tool 11 6 451 downwards and align to cylinder head. Tighten down special tool 11 6 451.

after bracket is on head, slide pin into hole on timing disc, and lock pin with allen screw. DO THIS ON BOTH SIDES

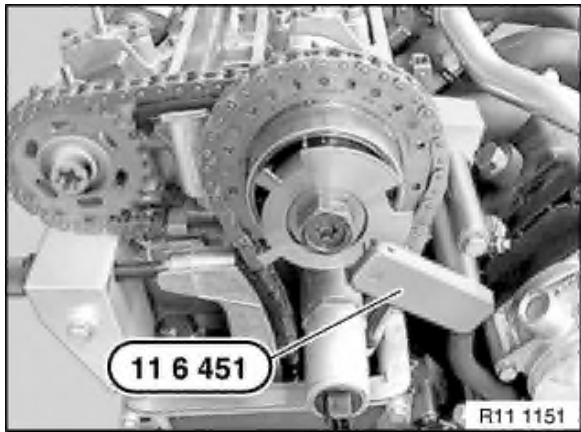


Caution!

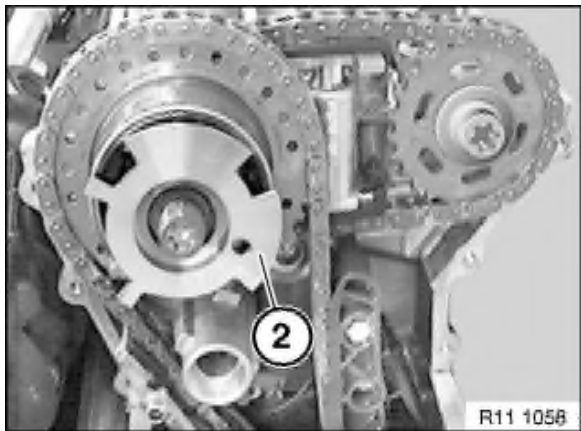
Left-hand threads.

Tighten down nut (1) on sensor gear screw connection.

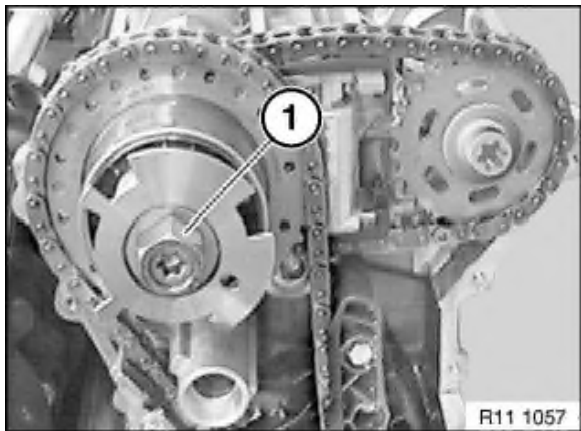
Tightening torque, 11 36 15AZ .



Remove special tool 11 6 451 from right cylinder head on cylinder bank 1 to 4.



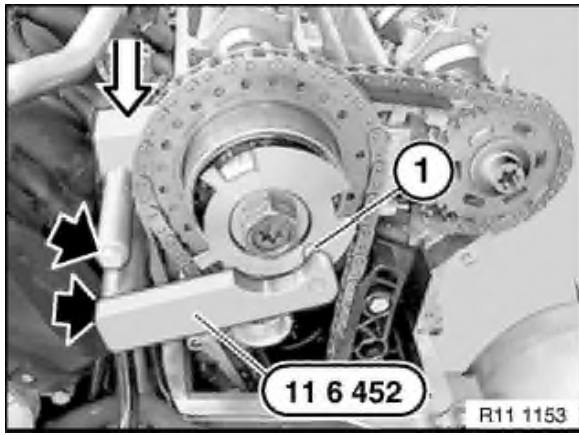
Attach sensor gear (2) to cylinder bank 5 to 8.



Caution!

Left-hand threads.

Fit nut (1) of sensor gear screw connection on cylinder bank 5 to 8 and initially tighten without play, but do not tighten down yet.



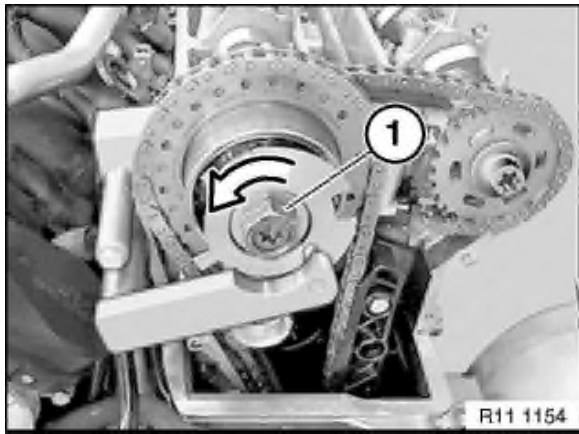
Note:

Special tool kit 11 6 450 comprises:

Special tool 11 6 451 for cylinder bank 1 to 4

Special tool 11 6 452 for cylinder bank 5 to 8


Align locating bore (1) on sensor gear of cylinder bank 5 to 8 to positioning pin on special tool 11 6 452. Fit special tool 11 6 452, insert screws and initially tighten without play. Press special tool 11 6 452 downwards and align to cylinder head. Tighten down special tool 11 6 452.



Caution!

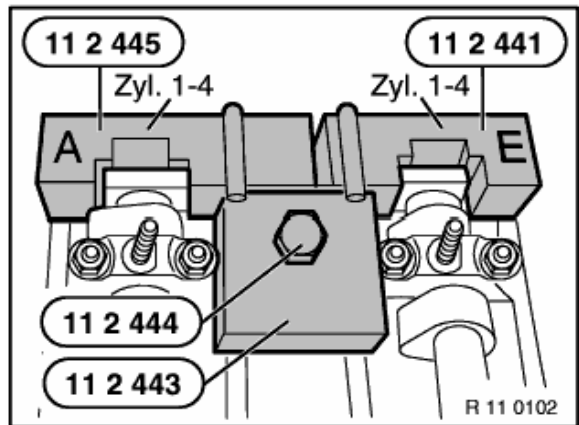
Left-hand threads.

Tighten down nut (1) on sensor gear screw connection.

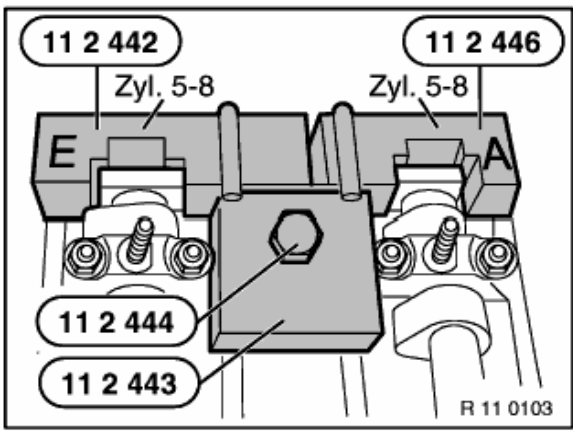
Tightening torque, 11 36 15AZ 



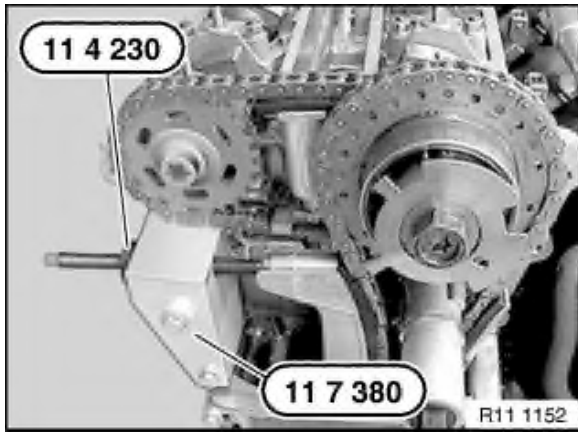
Remove special tool 11 6 452 from left cylinder head on cylinder bank 5 to 8.



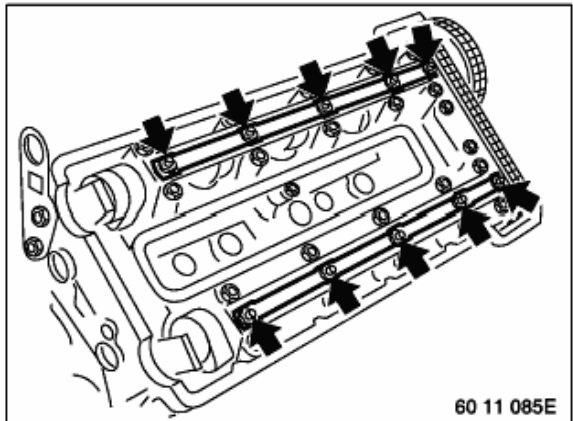
Remove special tools 11 2 444 / 11 2 443 / 11 2 445 / 11 2 441.



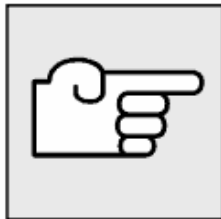
Remove special tools 11 2 444 / 11 2 443 / 11 2 442 / 11 2 446 .



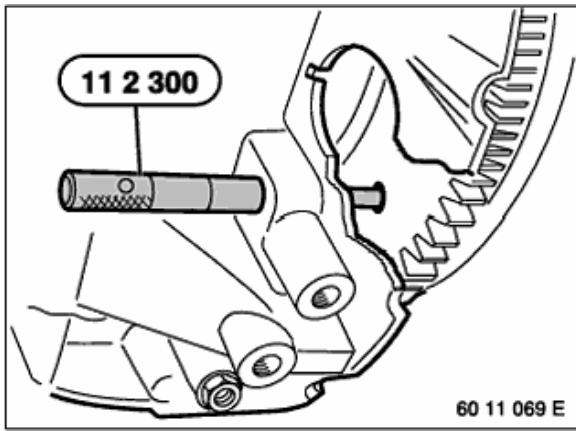
Relieve tension on special tool 11 4 230 .
Remove special tool 11 7 380 from right cylinder head on cylinder bank 1 to 4.



Install oil lines on left and right of cylinder head.



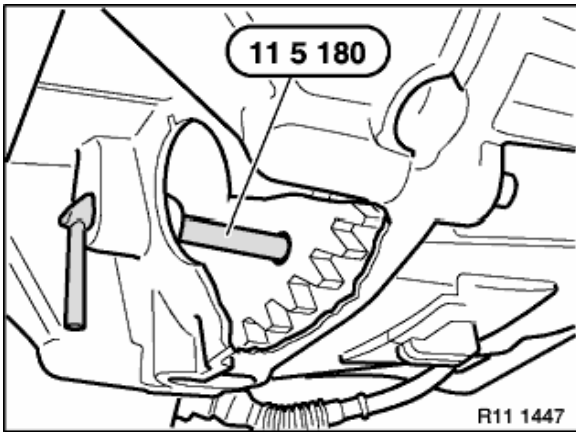
Install both timing case covers at top.
Install chain tensioning piston.
Install both cylinder head covers.



E38/E39

Remove special tool 11 2 300 .

I THINK BOTH OF THESE TOOLS ARE THE SAME DIMENSIONALLY.. I USED THE BOTTOM ONE, IT WAS EASIER TO GET IT IN AND OUT BECAUSE OF MINIMAL CLEARANCE UNDER THE CAR.



E53 (X5)

Remove special tool 11 5 180 .

Assemble engine.

use 1 1/16 socket to rotate crank by hand for 4 revolutions to be sure that the timing is correct.

11 31 Camshaft

	Type	Thread	Tightening specification	Measure
1AZ Camshaft bearing cap		M6		10 Nm
		M7		14 Nm
		M7- 8.8		15 Nm
		M8		20 Nm
2AZ Sprocket to camshaft	M20 / M21 / M40	M10		65 Nm
3AZ Sprocket to camshaft flange	M60 / M62	M6		15 Nm
		M6		10 Nm
	M50 / M52 / M52TU / M54 / M56 / S52 / S50 US / M50 / VANOS	M7	Application torque Jointing torque	5 Nm 20 Nm
		M7		15 Nm
4AZ Sprocket to camshaft	M51 / M41 / M47 / M57	M12 x 1.5	Replace screws	
			Jointing torque	20 Nm
			Torque angle	35 °
	M47TU / M57TU	M12 x 1.5	Replace screws	
			Jointing torque	20 Nm
			Torque angle	50 °
M67	M12 x 1.5	Replace screws		
		Jointing torque	20 Nm	
		Torque angle	90 °	
5AZ Toothed shaft to inlet camshaft	M52 / S52 / S50 US / M50 / VANOS	M14 x 1.5		

			Jointing torque	40 Nm
			Torque angle	60 °

11 14 Case Covers

	Type	Thread	Tightening specification	Measure
1AZ Timing case and timing case cover top and bottom		M6		10 Nm
		M7		15 Nm
		M8		22 Nm
		M10		47 Nm
2AZ End cover, front/rear, to engine block		M6		10 Nm
		M8		22 Nm
3AZ Bearing pin to timing case cover	M51 / M41 / M47	M42x1.5		65 Nm
4AZ Screw plug or connection piece to timing case cover Screw plug to timing case cover Screw plug to timing case cover	M51 / M41 / M47	M20x1.5		30 Nm
	M57 / M47TU	M40x1.5		30 Nm
5AZ End cover, top/rear (water jacket), to engine block	N62TU / N73	M6		10 Nm
6AZ Lower timing case cover to crankcase	N62TU	M8		20 Nm
7AZ Upper timing case to cylinder head	N62TU	M6		10 Nm
8AZ End cover, rear, to crankcase	N62TU	M6		10 Nm

11 12 Cylinder Head with Cover

	Type	Thread	Tightening specification	Measure
7AZ Cylinder head bolts	M70 / S70 / M73	M10	Replace screws Do not wash off coating Jointing torque Torque angle Torque angle	30 Nm 60 ° 60 °
8AZ Cylinder head bolts	M60 / M62 / S62	M10	Replace screws Do not wash off coating Jointing torque Torque angle Torque angle	30 Nm 80 ° 80 °
	N62 / N62TU / N73	M10	Replace screws Do not wash off coating Jointing torque Torque angle Torque angle	30 Nm 90 ° 90 °

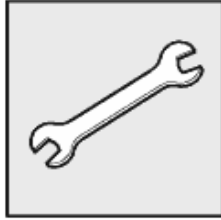
11 36 Variable Camshaft Control

	Type	Thread	Tightening specification	Measure
1AZ 4/2-way valve/solenoid valve to VANOS housing	M52 / M52TU / M54 / M56 / S52 / S50 US / M50 / VANOS			30 Nm
2AZ Banjo bolt to VANOS adjustment unit	M52 / M52TU / M54 / M56 / S52 / S50 US / M50 / VANOS	M14 x 1.5		32 Nm
3AZ Screw plug to VANOS adjustment unit	M52 / M52TU / M54 / M56 / S52 / S50 US / M50 / VANOS	M22 x 1.5		50 Nm
4AZ Left-hand thread: Set screw for hydraulic piston to toothed shaft	M52TU / M54 / M56	M6		10 Nm
5AZ Hydraulic line for VANOS to oil filter equipment carrier	M52 / M52TU / M54 / M56 / S52 / S50 US / M50 / VANOS			32 Nm
6AZ Collar nut on spline shaft	S50	M6		9 Nm
7AZ Cover to VANOS adjustment unit (hydraulic piston inlet side)	S50	M5		5 Nm
8AZ Filter screw to VANOS adjustment unit	S50	M10x1		12 Nm
9AZ Pressure line to VANOS adjustment unit	S62 / S54	M10 x 1		13 Nm
Pressure line to pressure accumulator and VANOS adjustment unit	S50	M12 x 1		20 Nm
10AZ Cover for solenoid valve to VANOS adjustment unit	S50 / B30	M5 8.8		6 Nm
	S50 / B32	M5 10.9		8 Nm
	S62	M7 10.9		19 Nm

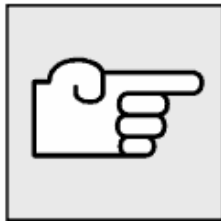
11AZ	Cover to VANOS adjustment unit (exhaust side)	S54 / S50 / B32	M6 10.9		13 Nm
12AZ	Solenoid valve on distributor	M62 / VANOS	M27x1.5		25 Nm
13AZ	Left-hand thread: Exhaust chain wheel to exhaust camshaft	M62 / VANOS	M12x1.5		125 Nm
14AZ	Left-hand thread: VANOS adjustment unit to inlet camshaft	M62 / VANOS	M12x1.5		110 Nm
15AZ	Left-hand thread: Nut of sensor gear screw fitting	M62 / VANOS	M18x1.5		40 Nm
16AZ	Adjustment unit to exhaust or inlet camshaft	N40 / N42 / N45 / N46	M10x1	Replace screws	
				Jointing torque	20 Nm
				Torque angle	90 °
				Torque angle	90 °
16AZ	Adjustment unit to exhaust or inlet camshaft	N62 / N62TU / N73	M10x1	Replace screws	
				Torque	80 Nm
17AZ	Non-return valve	N62 / N62TU / N73	M14x1.5		20 Nm

11 23 Vibration Damper

	Type	Thread	Tightening specification	Measure
1AZ Vee belt pulley on crankshaft	M10		Replace nut	190 Nm
2AZ Vibration damper / hub to crankshaft	M20 / M21 / M50 / M52 / M52TU / S50 US / S52 / M54 / M56	M18 x 1.5	Replace screws	410 Nm
	M30 / S14 / S38 / B35	M24 x 1.5	Replace nut	440 Nm
	M41 / M47 / M47TU / M51 / M60 / M62	M18 x 1.5	Replace screw	
			Jointing torque	100 Nm
			Torque angle	60 °
			Torque angle	60 °
			Torque angle	30 °
	N62 / N62TU / N73	M18 x 1.5	Replace screw Grease head Jointing torque Torque angle Torque angle Torque angle	100 Nm 60 ° 60 ° 60 °
	M70 / S70 / M73	M18 x 1.5	Replace screw Jointing torque Torque angle Torque angle	100 Nm 60 ° 60 °
	M57 / M57TU / M67 / M67TU	M10	Replace screws Jointing torque Torque angle	40 Nm 60 °

**Special tools required:**

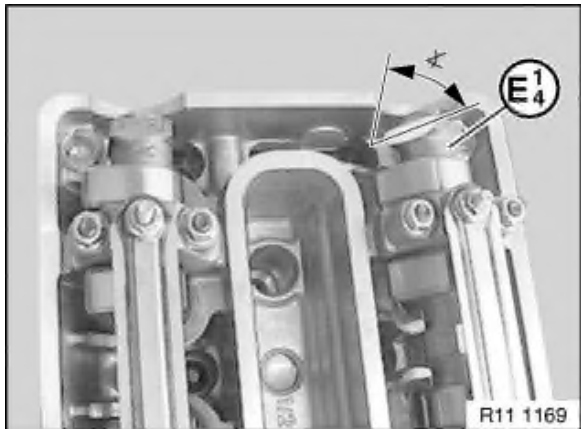
- 00 9 250
- 11 2 300
- 11 2 441
- 11 2 442
- 11 2 443
- 11 2 444
- 11 2 445
- 11 2 446
- 11 4 230
- 11 4 231
- 11 4 232
- 11 5 180
- 11 6 440
- 11 6 450
- 11 6 451
- 11 6 452
- 11 7 380

**Removal**

Removal of timing chain is described separately from installation.
Assembly sequence for removal and installation is different.

Remove spark plugs.

Remove both cylinder head covers.

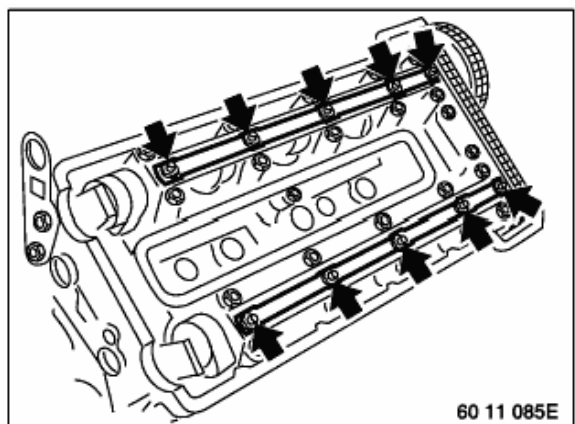


Note:

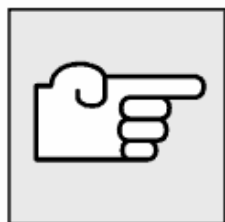
In firing TDC position, the inlet camshaft 1 to 4 rotates in the teeth of the camshaft adjustment unit.

Caution!

This twisting is caused by the position of the cams and is not an indication for incorrect timing.

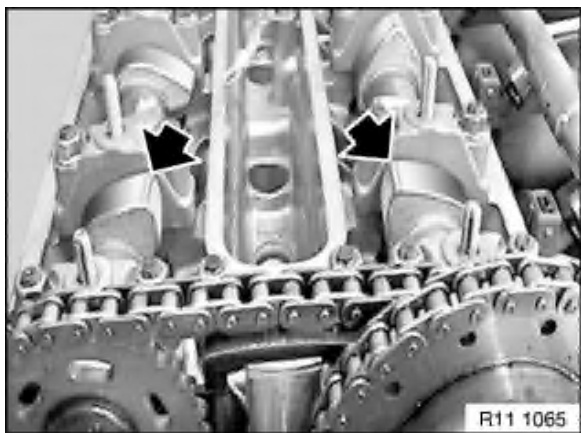


Remove oil lines on left and right of cylinder head.

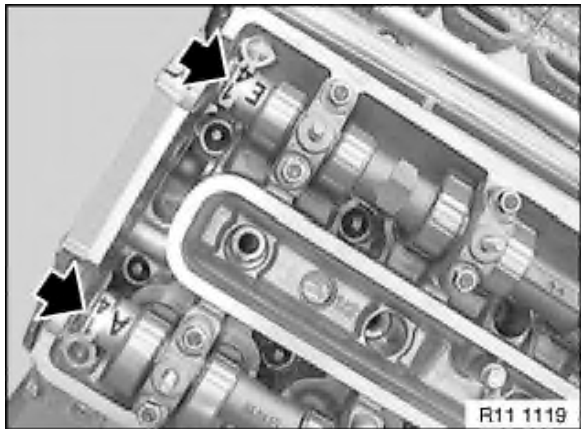


Remove vibration damper.

Slacken central screw of hub for vibration damper. This task is described in the section "Removing and installing hub for vibration damper".

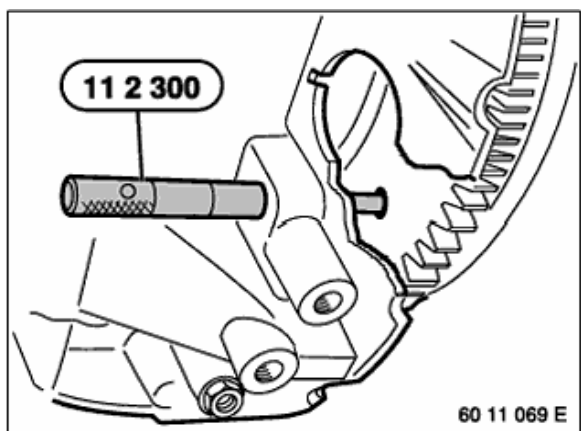


Rotate engine at slackened central bolt in direction of rotation until the first cylinder is in TDC firing position.



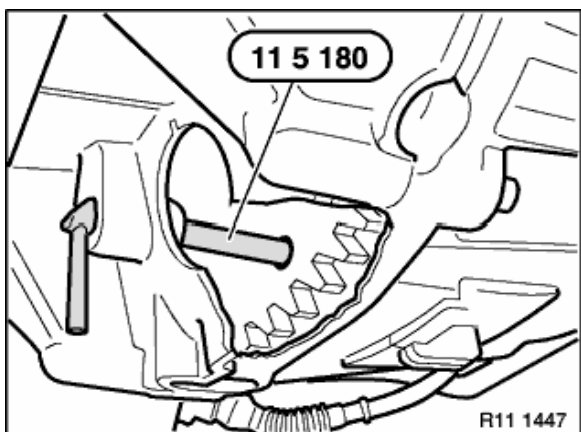
Note:

When the first cylinder is in TDC firing position, the camshaft markings face upwards.



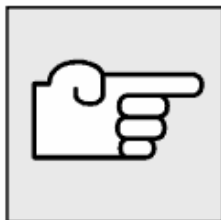
E38/E39

Secure crankshaft in TDC position with special tool 11 2 300 .



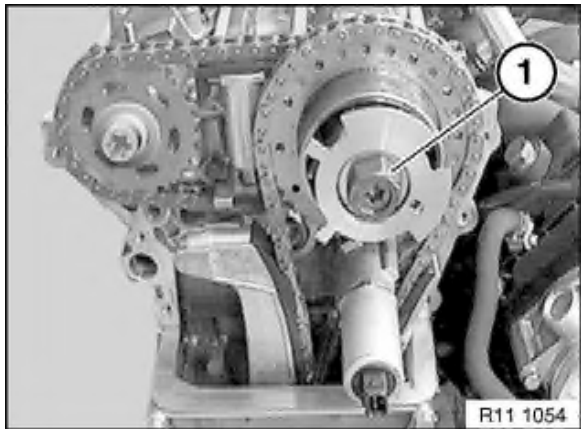
E53 (X5)

Secure crankshaft in TDC position with special tool 11 5 180 .



Remove chain tensioning piston.

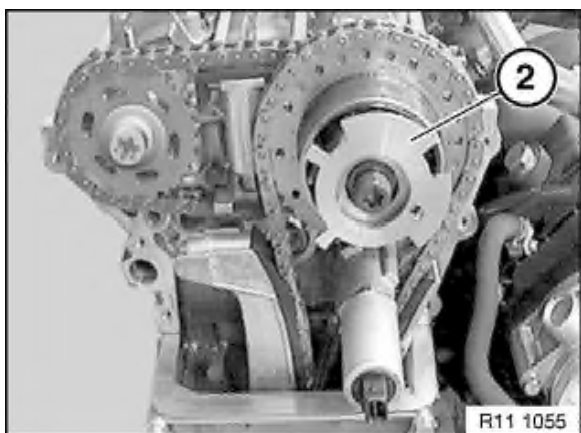
Remove both timing case covers at top.



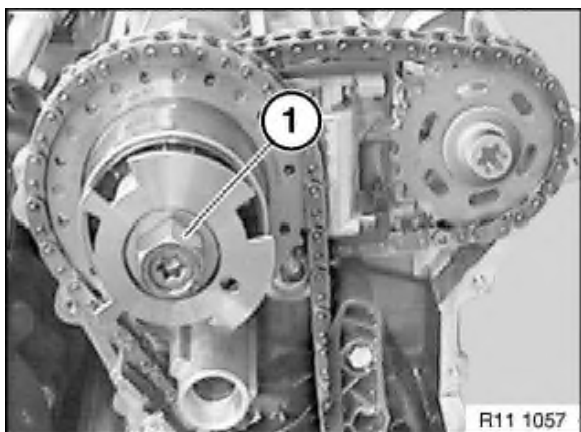
Caution!

Left-hand threads.

Release nut (1) on sensor gear screw connection on cylinder bank 1 to 4.



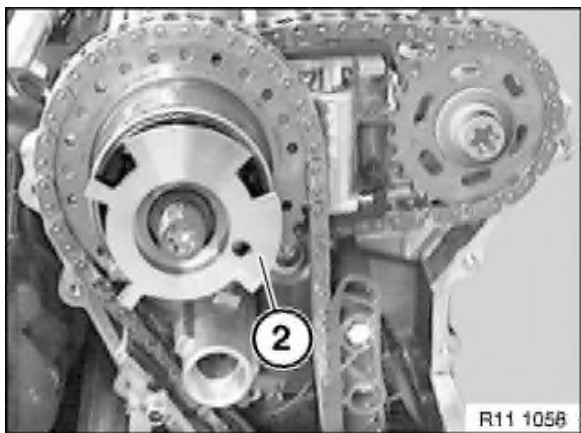
Remove sensor gear (2) on cylinder bank 1 to 4.



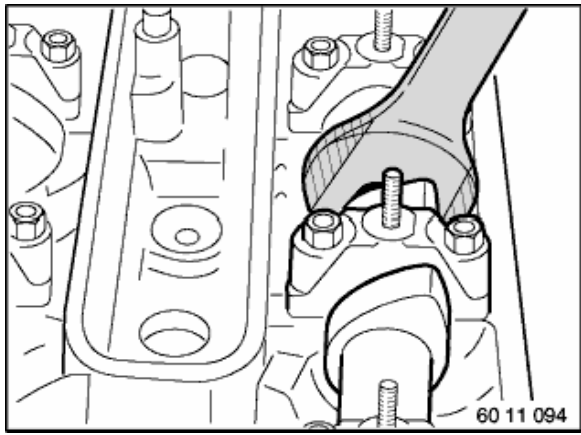
Caution!

Left-hand threads.

Release nut (1) on sensor gear screw connection on cylinder bank 5 to 8.



Remove sensor gear (2) on cylinder bank 5 to 8.

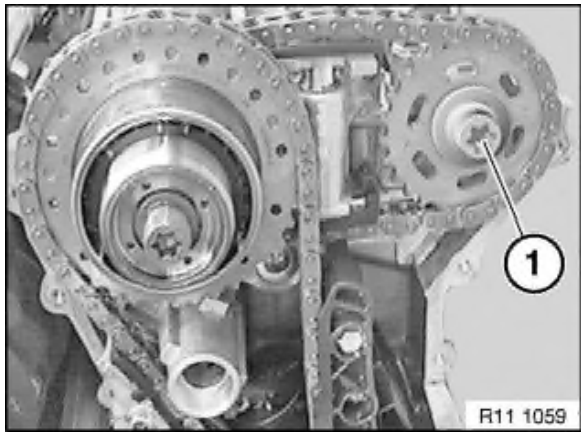


Caution!

Do not damage the cylinder head.

If necessary, machine open-end wrench accordingly.

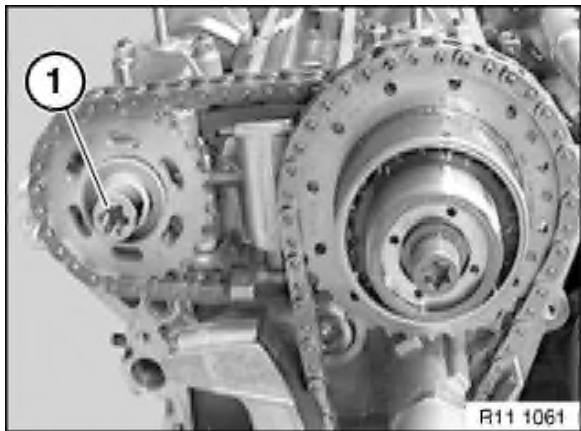
When releasing camshaft screw connection: grip camshaft at hexagon head.



Caution!

Left-hand threads.

Slacken screw connection (1) of exhaust camshaft on cylinder bank 5 to 8 by approx. a half turn.

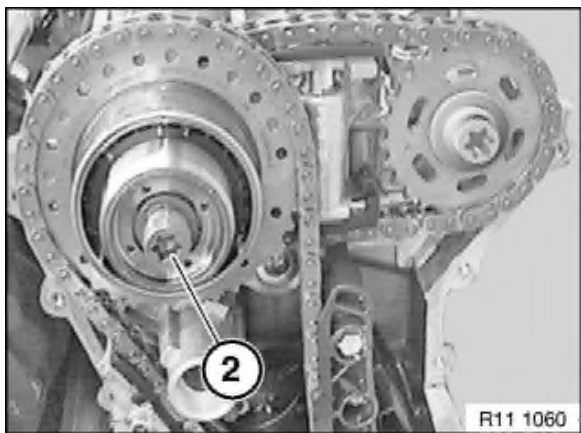


Caution!

Left-hand threads.

When releasing camshaft screw connection: grip camshaft at hexagon head.

Slacken screw connection (1) of exhaust camshaft on cylinder bank 1 to 4 by approx. a half turn.

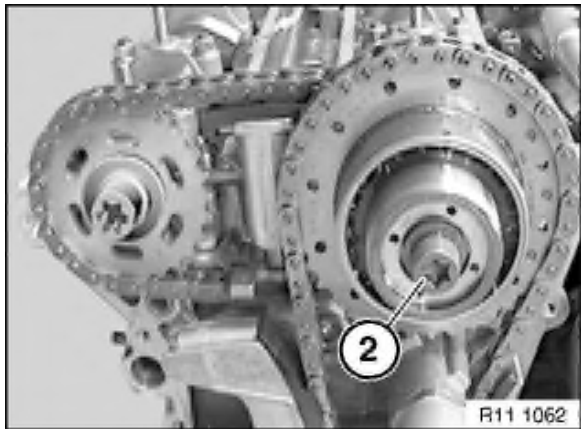


Caution!

Left-hand threads.

When releasing camshaft screw connection: grip camshaft at hexagon head.

Slacken screw connection (2) of inlet camshaft on cylinder bank 5 to 8 by approx. a half turn.

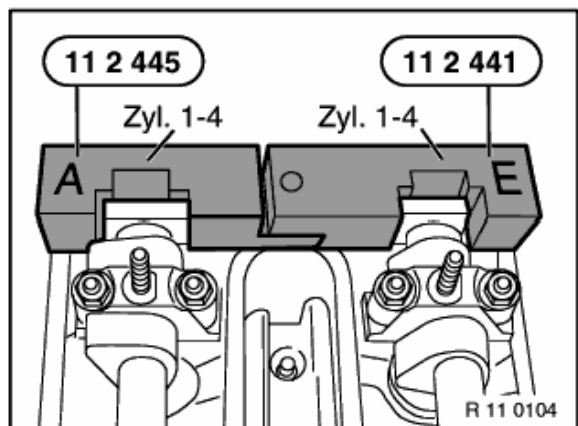


Caution!

Left-hand threads.

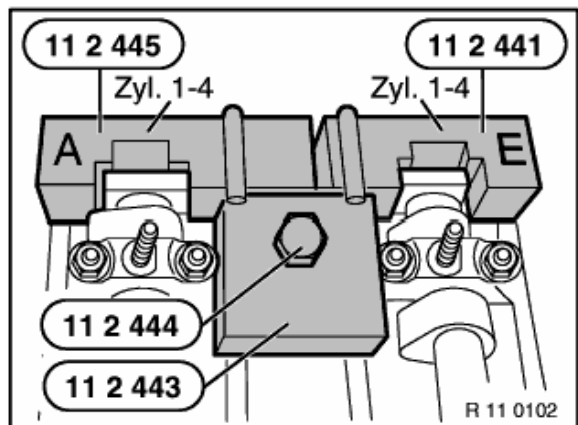
When releasing camshaft screw connection: grip camshaft at hexagon head.

Slacken screw connection (2) of inlet camshaft on cylinder bank 1 to 4 by approx. a half turn.

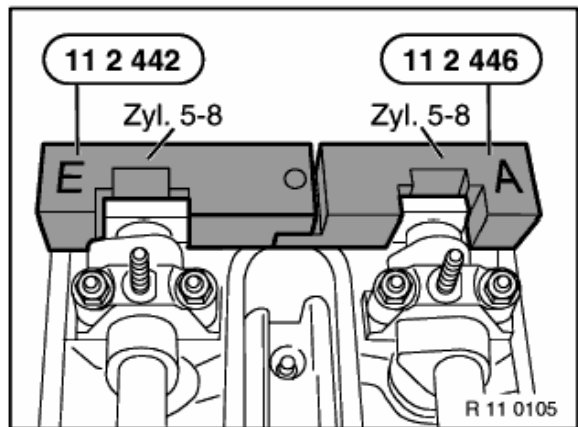


Align camshafts.

Attach special tool 11 2 445 / 11 2 441 to camshafts, cylinder bank 1 to 4.

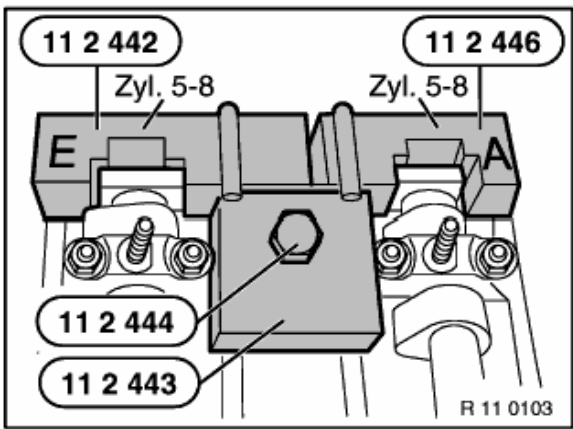


Attach special tool 11 2 443 to special tool 11 2 445 / 11 2 441 and secure with special tool 11 2 444 via spark plug thread.

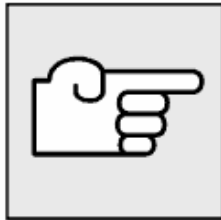


Align camshafts.

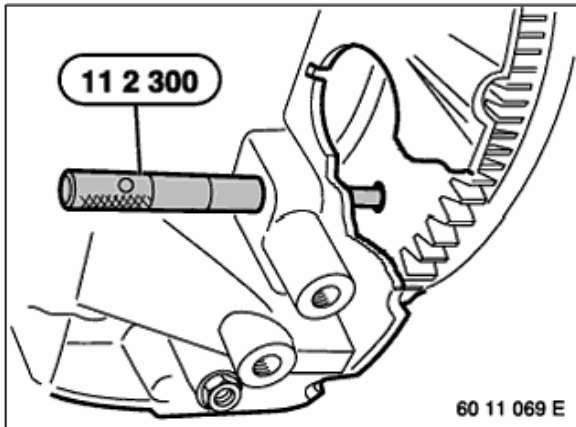
Attach special tool 11 2 442 / 11 2 446 to camshafts, cylinder bank 5 to 8.



Attach special tool 11 2 443 to special tool 11 2 446 / 11 2 442 and secure with special tool 11 2 444 via spark plug thread.



Remove slackened central bolt and remove hub for vibration damper.

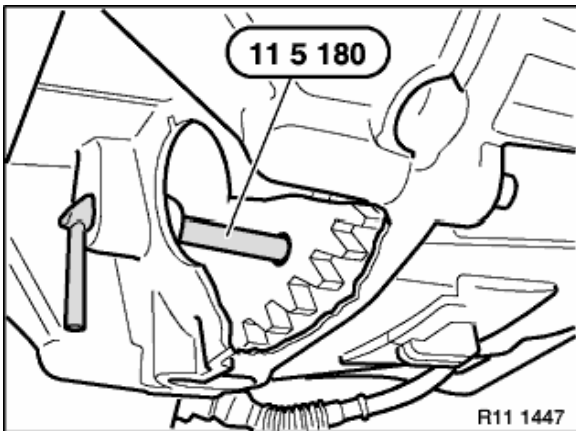


E31/E38/E39

Caution!

Do not turn engine any more.

Remove special tool 11 2 300 .

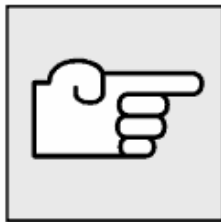


E53 (X5)

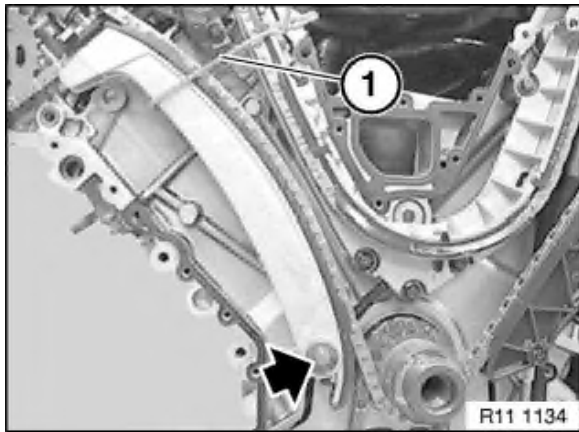
Caution!

Do not turn engine any more.

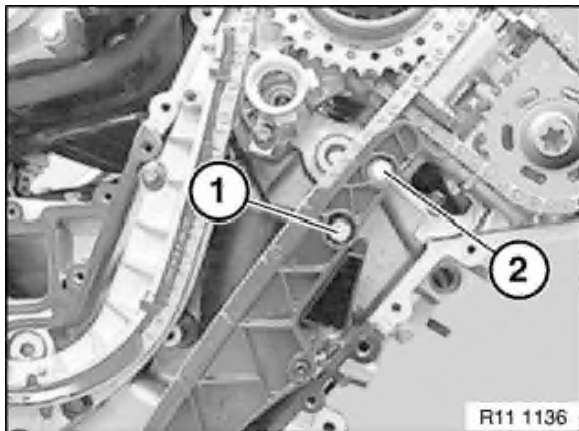
Remove special tool 11 5 180 .



Remove upper oil sump section.
Remove water pump with thermostat housing.
Remove lower timing case cover.



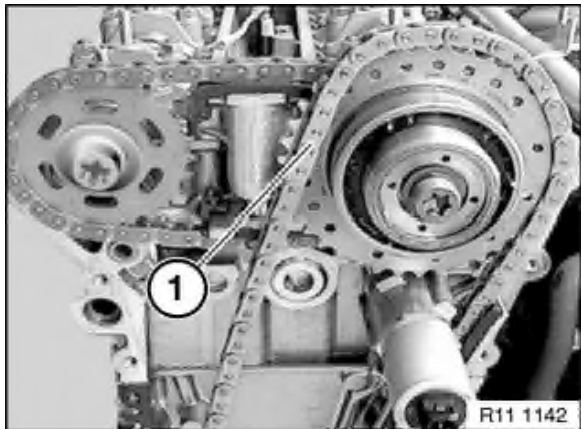
Release retaining screw on tensioning rail.
Open plastic strap (1).
Remove tensioning rail with oil guide.



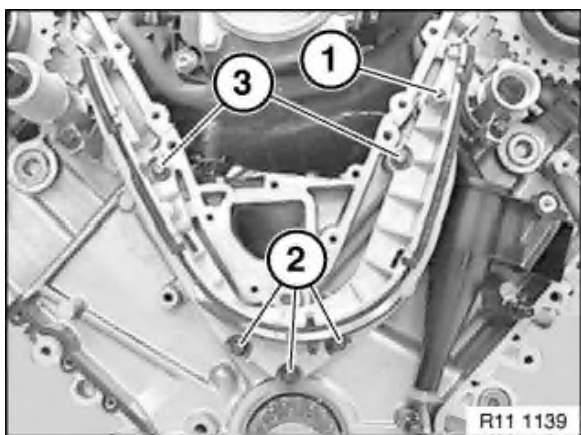
Note:
Engines in E53 (X5) have an external oil separator. Screw (1) is not fitted.
Release screw (1) for oil separator.
Release retaining screw (2) for guide rail.



Using a small screwdriver, carefully push back retaining lug on guide rail and detach guide rail.



Feed timing chain (1) out of camshaft adjustment unit and remove.



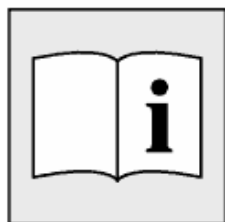
Note:

Engines in E53 (X5) have an external oil separator. Grub screw (1) is not fitted.

If necessary, remove reversing rail.

Unfasten grub screw (1).

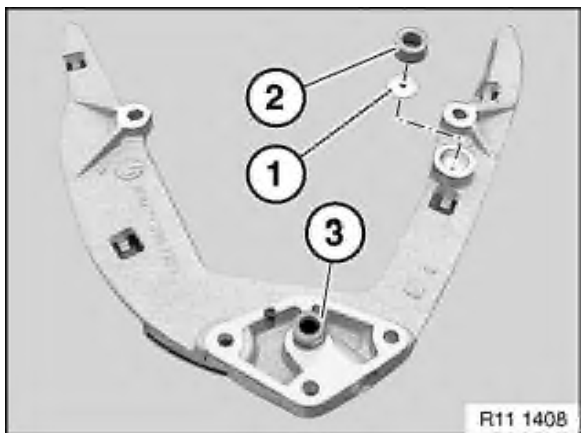
Release retaining screws (2 and 3) on reversing rail and remove reversing rail.



Installation

Installation of timing chain is described separately from removal. Assembly sequence for removal and installation is different.

Check guide, reversing and tensioning rails, replace if necessary.



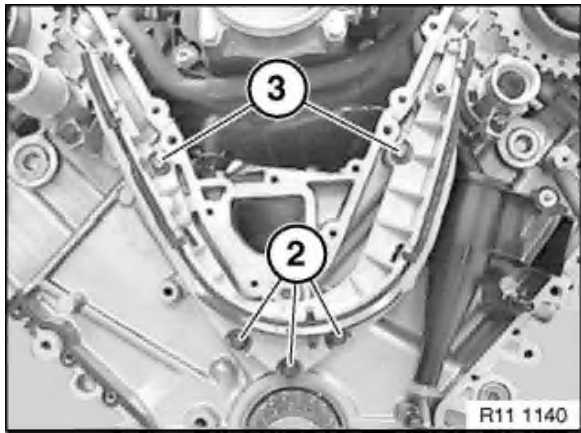
Note:

There is a small bore in the throttle ring (1).

Check throttle ring (1), replace if necessary.

1. Insert throttle ring (1) in reversing rail
2. Replace O-ring (2) and insert in reversing rail
3. Replace O-ring (3)

Coat O-ring (3) with oil as lubricant.



Install reversing rail and insert screws (2 and 3).

Note:

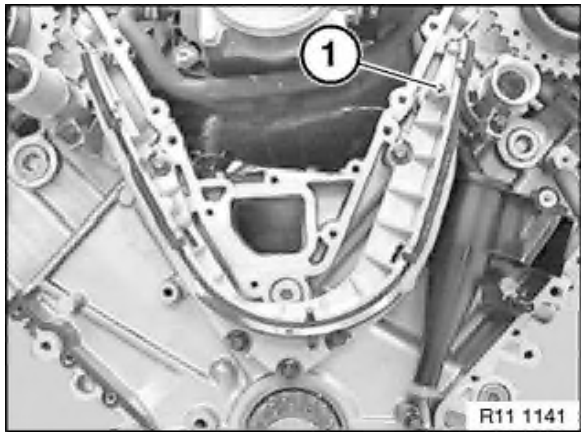
Screws (2) with M6 thread.

Screws (3) with M7 thread.

Tighten screws (2 and 3).

Tightening torque for screws (2 and 3).

Technical Data, 11 31 10AZ



Note:

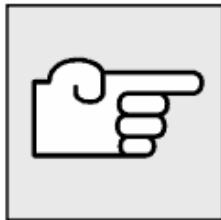
Engines in E53 (X5) have an external oil separator. Grub screw (1) and angle section are not fitted.

Replace grub screw (1).

Insert grub screw only until it makes contact with angle section (1) without play, do not tighten down.

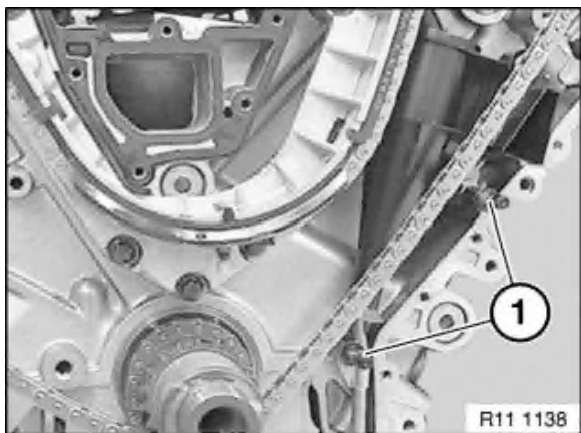
Note:

The grub screw (1) secures the angle bracket in the cylinder head.



Note:

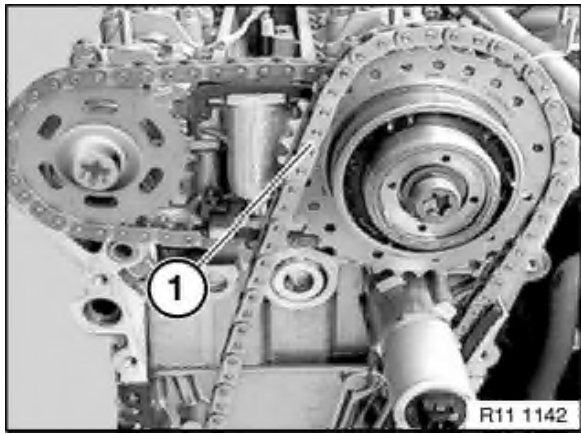
The position of the camshaft adjustment unit when fitting and feeding on the timing chain is not assigned and can be freely selected.



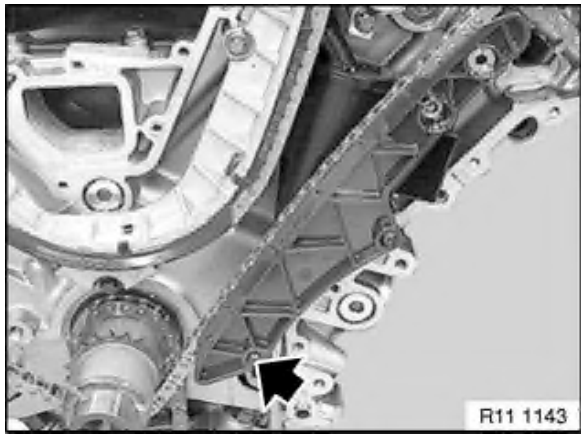
Install timing chain over reversing rail, camshaft adjustment unit of cylinder bank 5 to 8 and over crankshaft sprocket wheel.

Note:

Install timing chain inside screw-in pin (1).



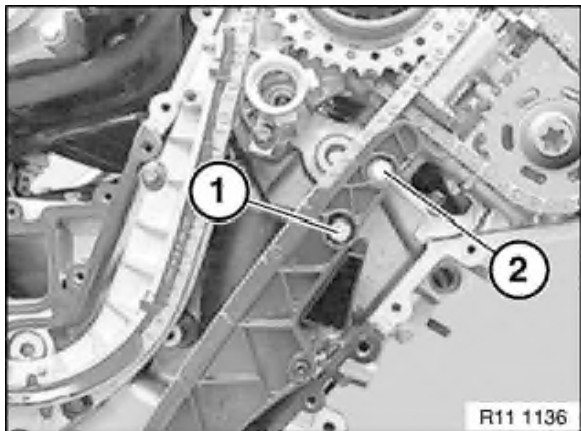
Feed timing chain (1) onto camshaft adjustment unit of cylinder bank 1 to 4.



Raise timing chain slightly in area of guide rail.

Slide guide rail over guide pin until retaining lug can be heard snapping into place on lower guide pin.

Align timing chain to guide rail.



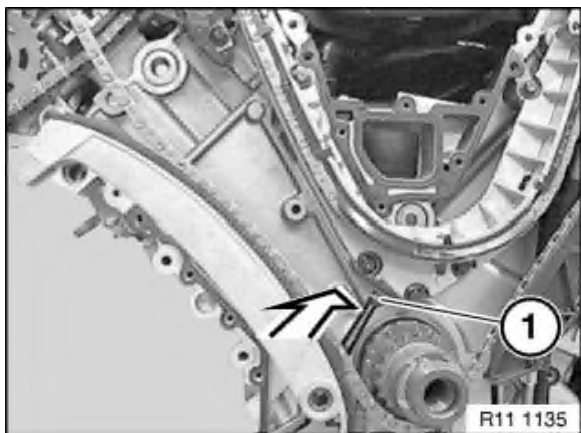
Note:

Engines in E53 (X5) have an external oil separator. Screw (1) is not fitted.

Insert screws (1 and 2).

Tighten screw (2).

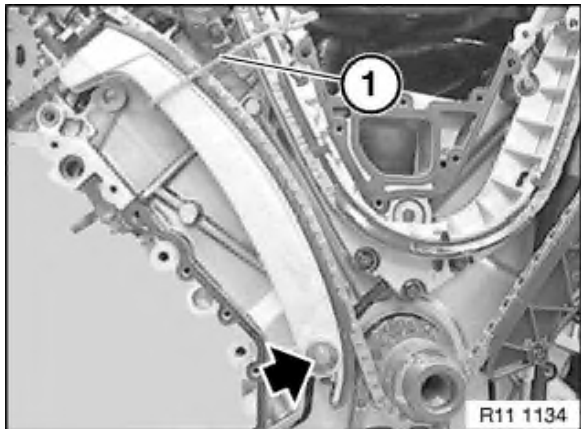
Tighten down screw (1) for oil separator.



Replace O-ring (1).

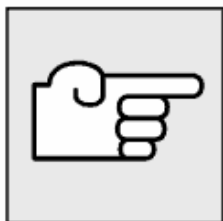
Install oil guide for bow cover in the pivot rail.

Insert screw on tensioning rail.



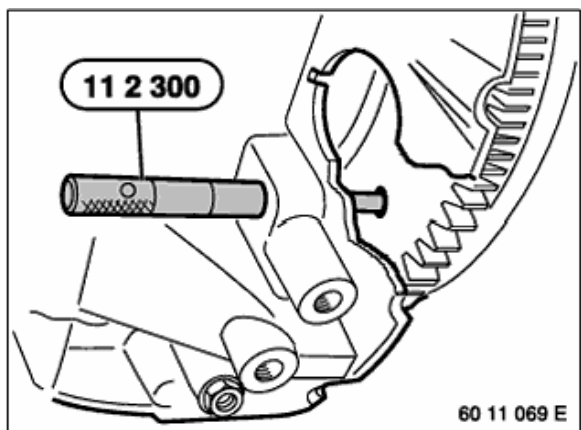
Press bow cover against the timing chain. Secure bow cover with a plastic strap (1).

Tighten down screw on tensioning rail.



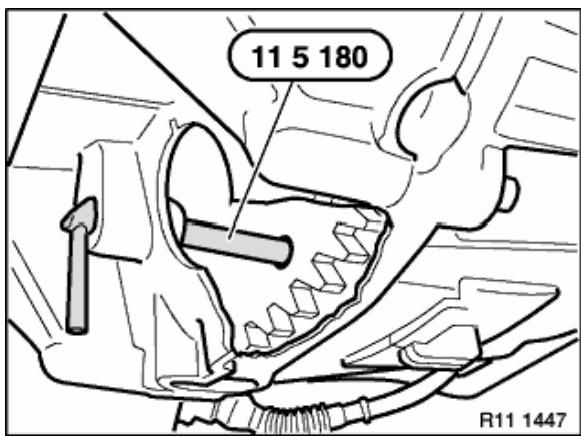
Install timing case cover at bottom.

Install upper oil sump section.



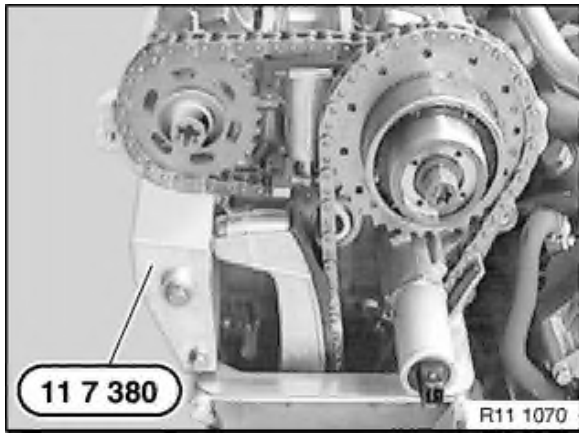
E38/E39

Secure crankshaft with special tool 11 2 300 in TDC firing position.

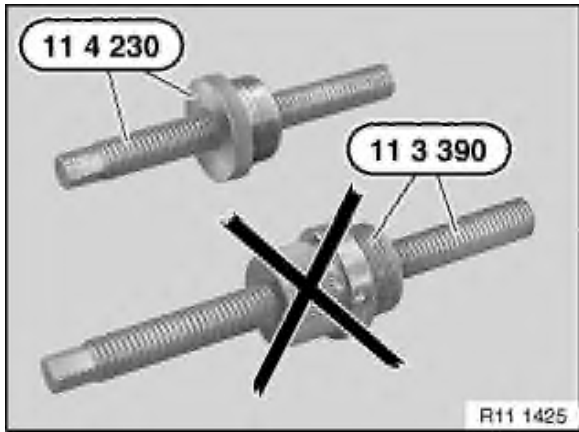


E53 (X5)

Secure crankshaft in TDC position with special tool 11 5 180 .



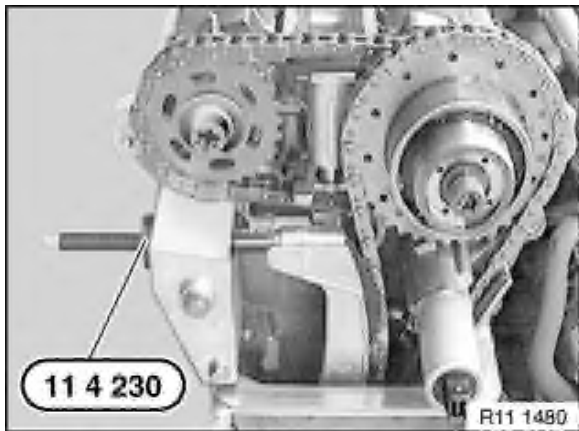
Fit special tool 11 7 380 to right cylinder head on cylinder bank 1 to 4.



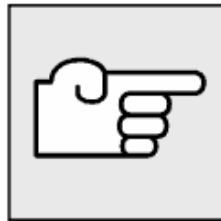
Note:

The special tool kit 11 3 390 can no longer be fitted in the E53 (X5) with M62 engine due to the altered space conditions. With the market launch of the E53 (X5) with M62 engine, the special tool kit 11 3 390 is dropped.

The shorter special tool kit 11 4 230 comprising special tools 11 4 231 and 11 4 232 replaces the special tool kit 11 3 390.



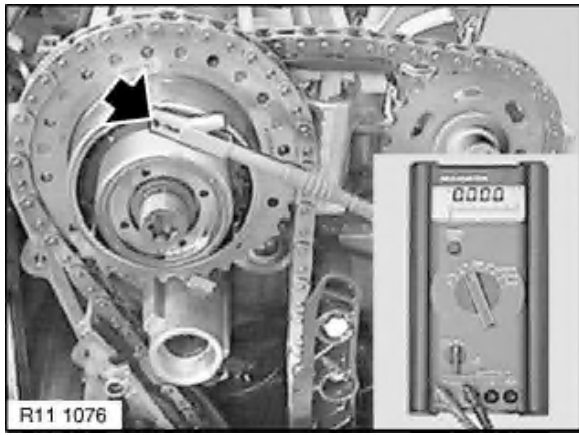
Insert special tool 11 4 230 in special tool 11 7 380. Screw in adjustment screw on tensioning rail, but do not tighten yet.



Note:

The continuity test with the multimeter described in the following is not possible on the M62 B46 because of the different design of the camshaft adjustment unit.

The remaining procedure is identical.



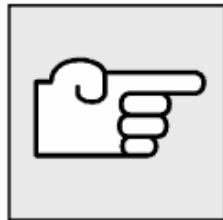
Connect a commercially available multimeter to a contact pin on camshaft adjustment unit and to the screw connection on oil line on cylinder bank 5 to 8.

Set multimeter to acoustic continuity test.



Attach special tool 11 6 440 to camshaft adjustment unit on cylinder bank 5 to 8 and move at 40 Nm to left-hand stop.

Check left-hand stop of camshaft adjustment unit with acoustic continuity test on multimeter.

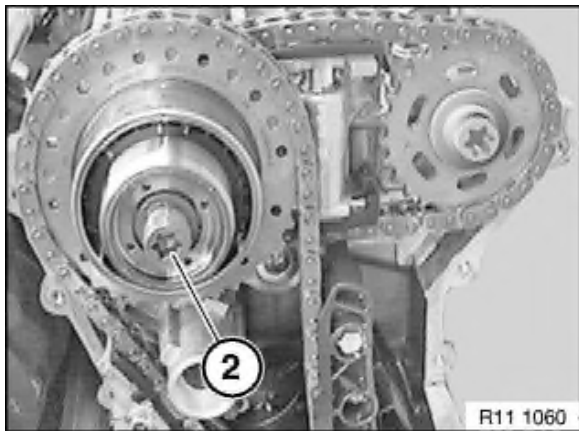


Note:

Rotating the camshaft adjustment unit at 40 Nm to the left-hand stop ensures that the end position is reached and there is no longer an "oil cushion" before the left-hand stop of the camshaft adjustment unit.

In the camshaft adjustment unit, there are three contacts which are closed when the unit is at the left-hand stop.

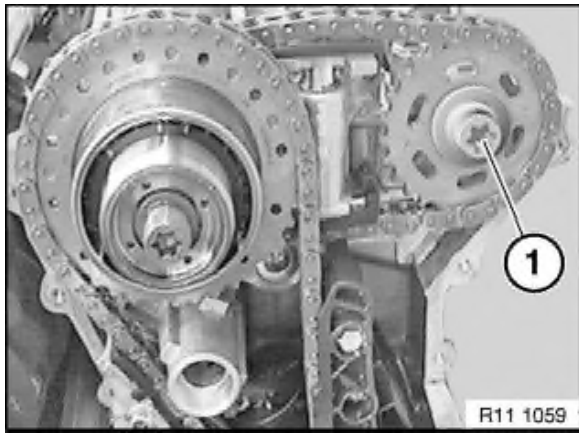
During the acoustic continuity test with the multimeter, a sound signal can be heard when the camshaft adjustment unit is at the left-hand stop.



Caution!

Left-hand threads.

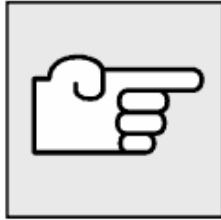
Tighten screw connection (2) of inlet camshaft on cylinder bank 5 to 8 to an initial torque of 15 Nm and then slacken off again by a 1/4 turn.



Caution!

Left-hand threads.

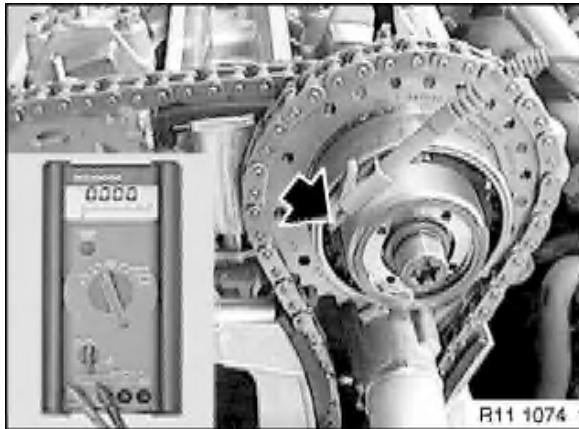
Tighten screw connection (1) of exhaust camshaft on cylinder bank 5 to 8 to an initial torque of 15 Nm and then slacken off again by a 1/4 turn.



Note:

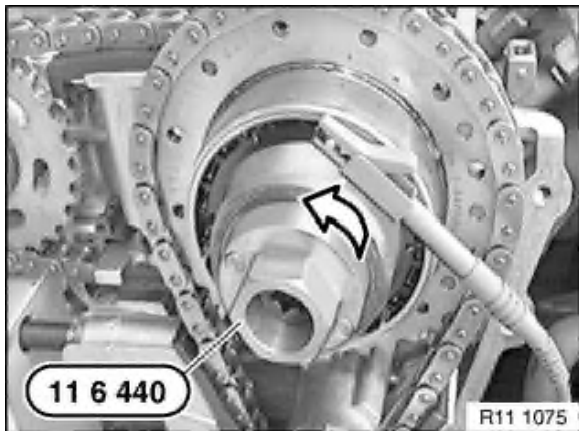
The continuity test with the multimeter described in the following is not possible on the M62 B46 because of the different design of the camshaft adjustment unit.

The remaining procedure is identical.



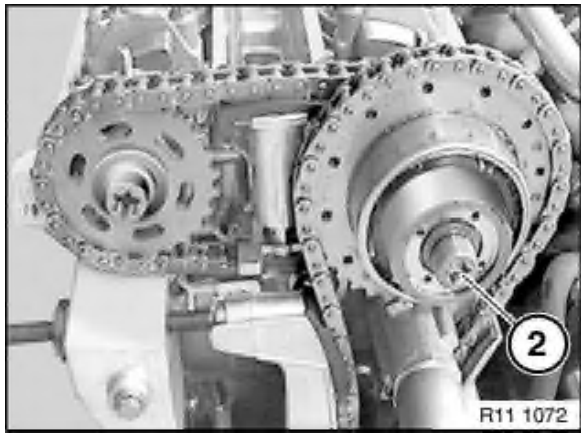
Connect a commercially available multimeter to a contact pin on camshaft adjustment unit and to the screw connection on oil line on cylinder bank 1 to 4.

Set multimeter to acoustic continuity test.



Attach special tool 11 6 440 to camshaft adjustment unit on cylinder bank 1 to 4 and move at 40 Nm to left-hand stop.

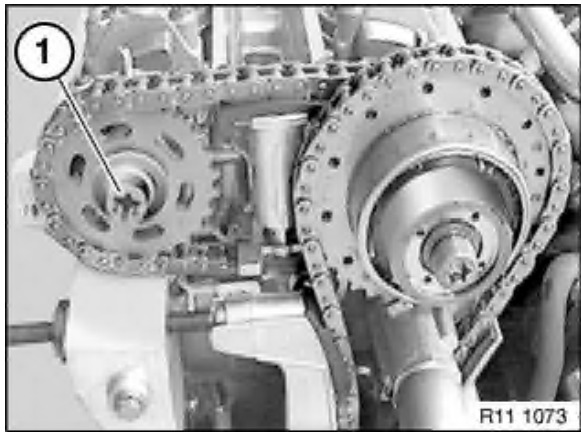
Check left-hand stop of camshaft adjustment unit with acoustic continuity test on multimeter.



Caution!

Left-hand threads.

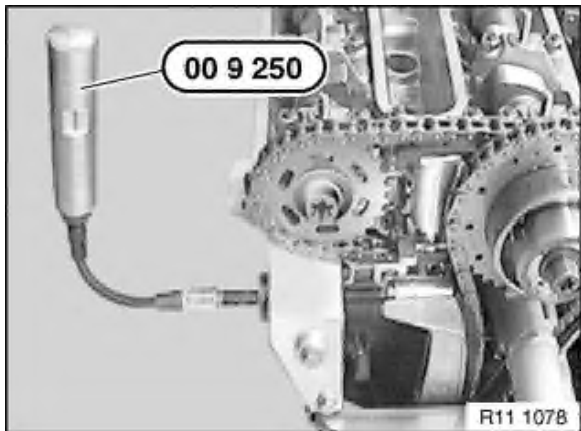
Tighten screw connection (2) of inlet camshaft on cylinder bank 1 to 4 to an initial torque of 15 Nm and then slacken off again by a 1/4 turn.



Caution!

Left-hand threads.

Tighten screw connection (1) of exhaust camshaft on cylinder bank 1 to 4 to an initial torque of 15 Nm and then slacken off again by a 1/4 turn.



Pretension tensioning rail by turning adjusting screw on special tool 11 4 230 with special tool 00 9 250 to 0.7 Nm.

Note:

If installation tolerance is unfavorable, attach special tool 00 9 250 from underside.

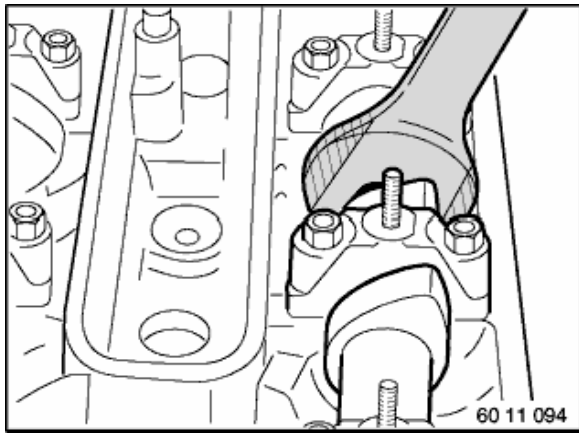


Note:

Pretensioning the timing chain moves the camshaft adjustment unit and the unit must therefore be reset to the left-hand stop.

Attach special tool 11 6 440 to camshaft adjustment unit on cylinder bank 5 to 8 and move at 40 Nm to left-hand stop.

Check left-hand stop of camshaft adjustment unit with acoustic continuity test on multimeter.

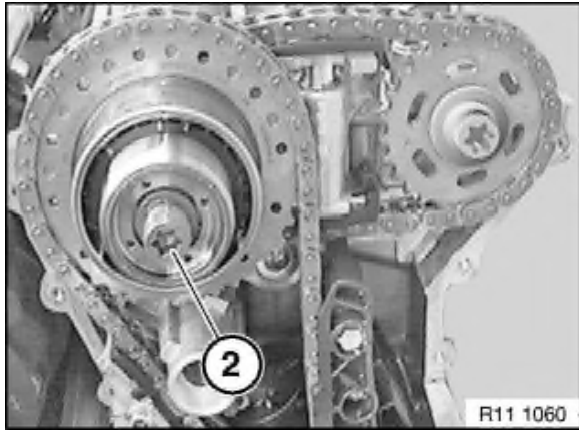


Caution!

Do not damage the cylinder head.

If necessary, machine open-end wrench accordingly.

When tightening down camshaft screw connection: grip camshaft at hexagon head.

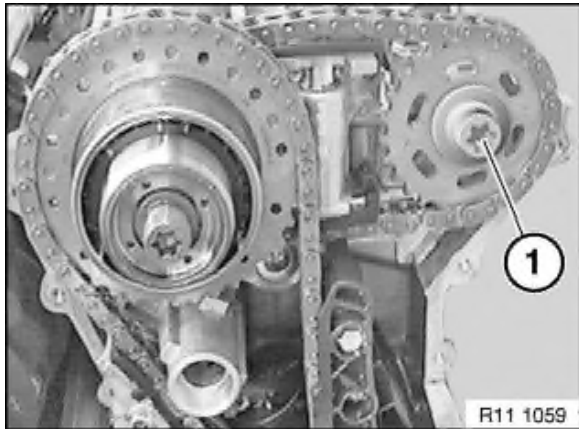


Caution!

Left-hand threads.

Tighten down screw connection (2) of inlet camshaft on cylinder bank 5 to 8.

Tightening torque, 11 36 14AZ .



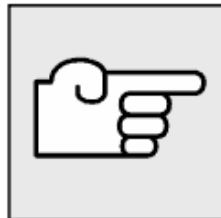
Caution!

Left-hand threads.

When tightening down camshaft screw connection: grip camshaft at hexagon head.

Tighten down screw connection (1) of exhaust camshaft on cylinder bank 5 to 8.

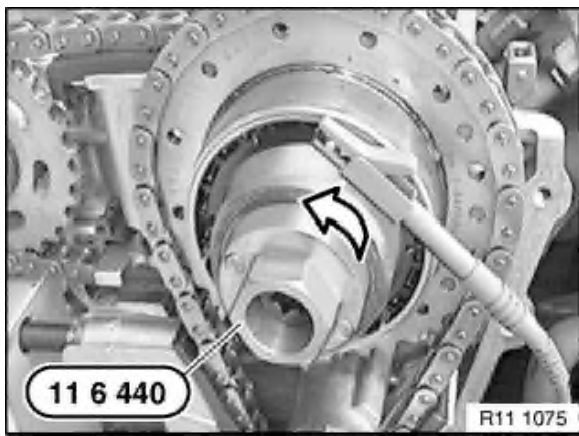
Tightening torque, 11 36 13AZ .



Note:

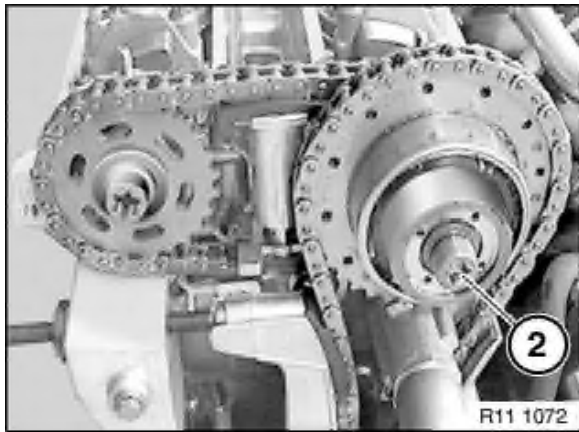
The continuity test with the multimeter described in the following is not possible on the M62 B46 because of the different design of the camshaft adjustment unit.

The remaining procedure is identical.



Attach special tool 11 6 440 to camshaft adjustment unit on cylinder bank 1 to 4 and move at 40 Nm to left-hand stop.

Check left-hand stop of camshaft adjustment unit with acoustic continuity test on multimeter.



Caution!

Left-hand threads.

When tightening down camshaft screw connection: grip camshaft at hexagon head.

Tighten down screw connection (2) of inlet camshaft on cylinder bank 1 to 4.

Tightening torque, 11 36 14AZ .



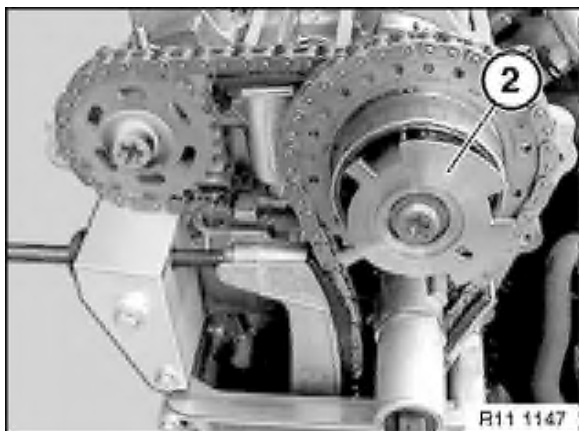
Caution!

Left-hand threads.

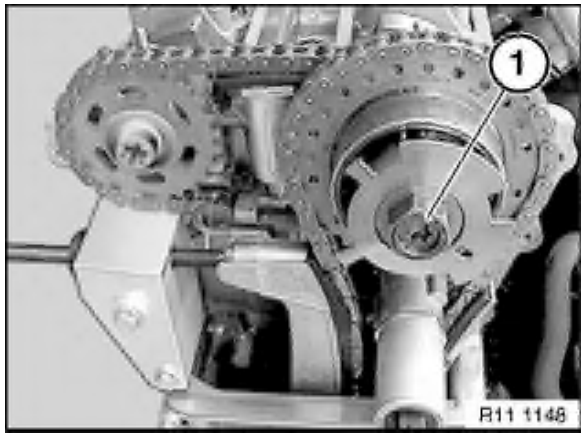
When tightening down camshaft screw connection: grip camshaft at hexagon head.

Tighten down screw connection (1) of exhaust camshaft on cylinder bank 1 to 4.

Tightening torque, 11 36 13AZ .



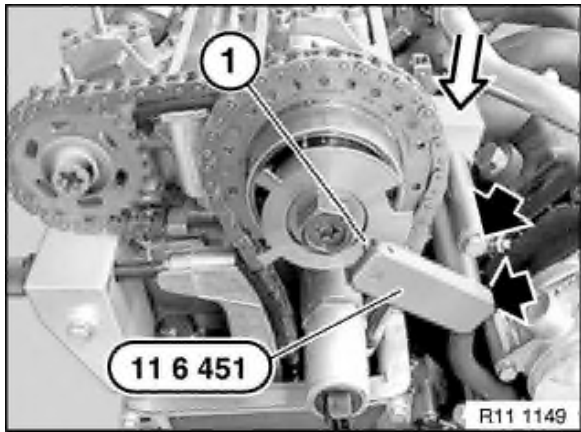
Attach sensor gear (2) to cylinder bank 1 to 4.



Caution!

Left-hand threads.

Fit nut (1) of sensor gear screw connection on cylinder bank 1 to 4 and initially tighten without play, but do not tighten down yet.



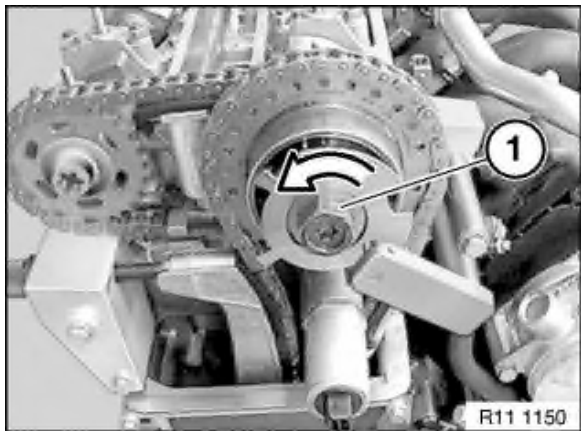
Note:

Special tool kit 11 6 450 comprises:

Special tool 11 6 451 for cylinder bank 1 to 4

Special tool 11 6 452 for cylinder bank 5 to 8

Align locating bore (1) on sensor gear of cylinder bank 1 to 4 to positioning pin on special tool 11 6 451. Fit special tool 11 6 451, insert screws and initially tighten without play. Press special tool 11 6 451 downwards and align to cylinder head. Tighten down special tool 11 6 451.



Caution!

Left-hand threads.

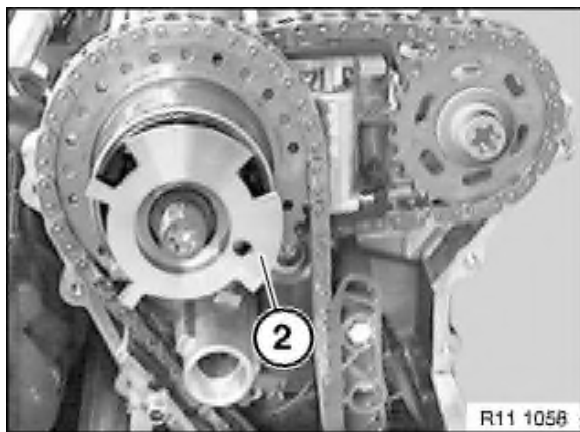
Tighten down nut (1) on sensor gear screw connection.

Tightening torque, 11 36 15AZ.



Remove special tool 11 6 451 from right cylinder head on cylinder bank 1 to 4.

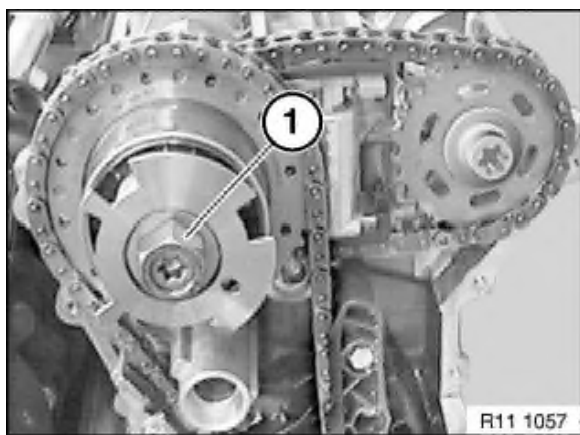
Attach sensor gear (2) to cylinder bank 5 to 8.



Caution!

Left-hand threads.

Fit nut (1) of sensor gear screw connection on cylinder bank 5 to 8 and initially tighten without play, but do not tighten down yet.



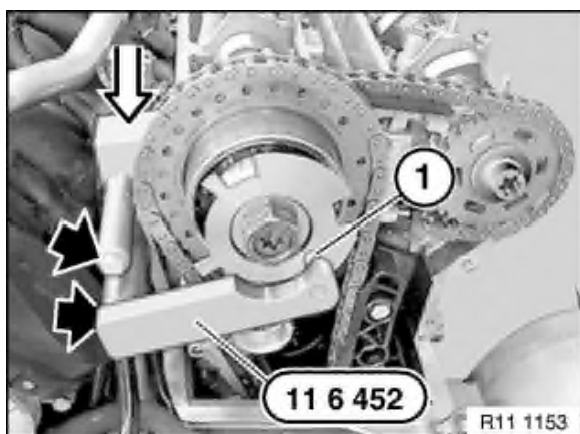
Note:

Special tool kit 11 6 450 comprises:

Special tool 11 6 451 for cylinder bank 1 to 4

Special tool 11 6 452 for cylinder bank 5 to 8

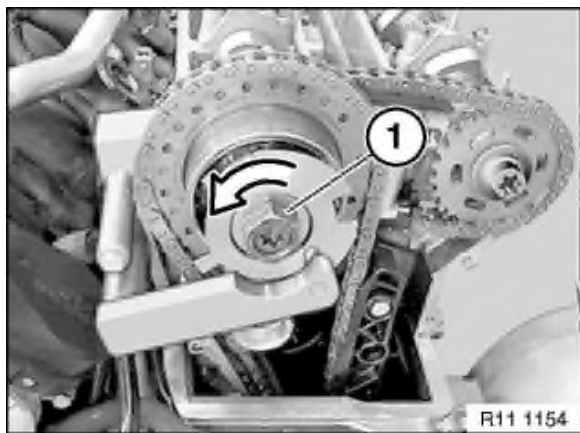
Align locating bore (1) on sensor gear of cylinder bank 5 to 8 to positioning pin on special tool 11 6 452. Fit special tool 11 6 452, insert screws and initially tighten without play. Press special tool 11 6 452 downwards and align to cylinder head. Tighten down special tool 11 6 452.



Caution!

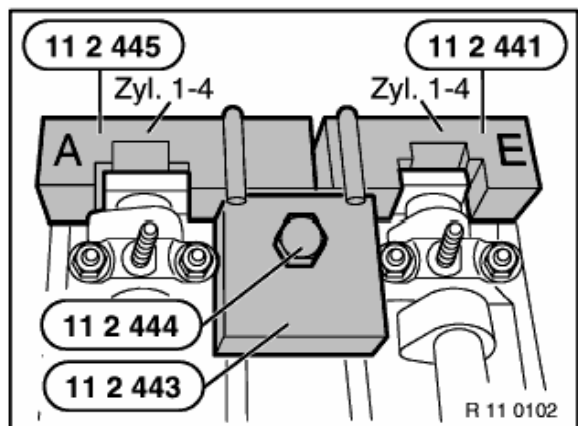
Left-hand threads.

Tighten down nut (1) on sensor gear screw connection.
Tightening torque, 11 36 15AZ.

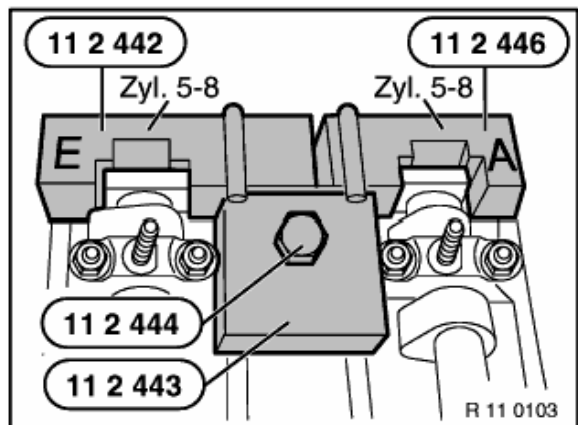




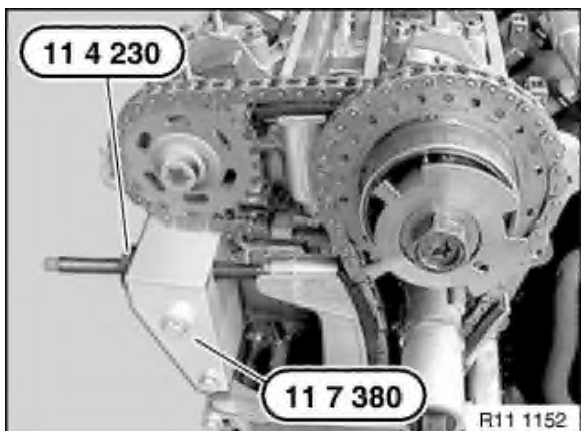
Remove special tool 11 6 452 from left cylinder head on cylinder bank 5 to 8.



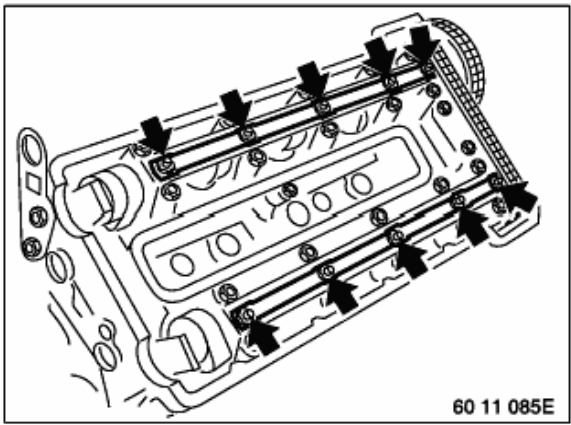
Remove special tools 11 2 444 / 11 2 443 / 11 2 445 / 11 2 441 .



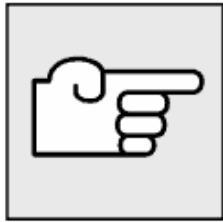
Remove special tools 11 2 444 / 11 2 443 / 11 2 442 / 11 2 446 .



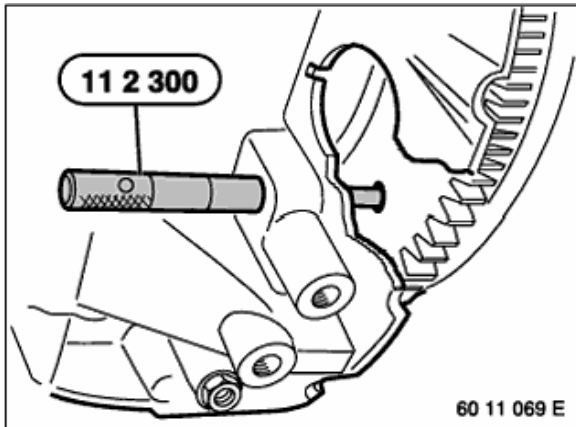
Relieve tension on special tool 11 4 230 .
Remove special tool 11 7 380 from right cylinder head on cylinder bank 1 to 4.



Install oil lines on left and right of cylinder head.

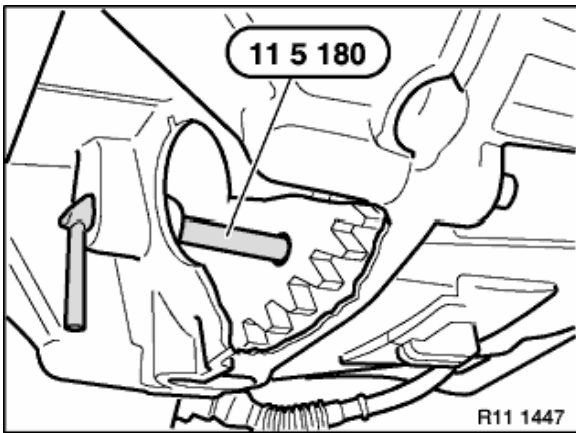


Install both timing case covers at top.
Install chain tensioning piston.



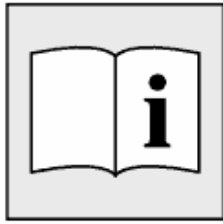
E38/E39

Remove special tool 11 2 300 .



E53 (X5)

Remove special tool 11 5 180 .
Assemble engine.

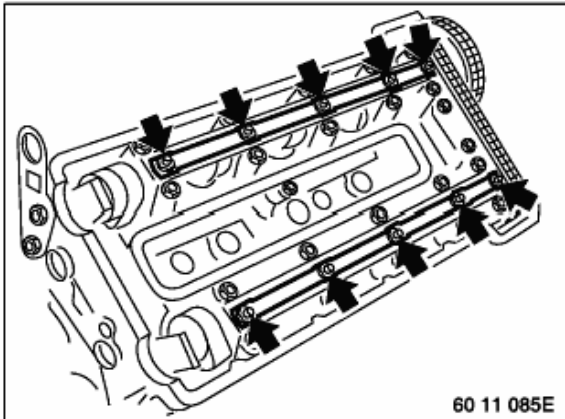


Removal

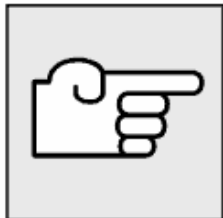
Removal of timing chain is described separately from installation. Assembly sequence for removal and installation is different.

Remove spark plugs,
refer to 12 12 011.

Remove both cylinder head covers,
refer to 11 12 004.

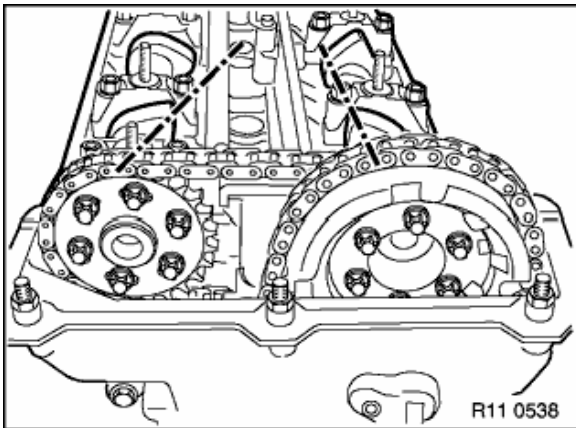


Remove oil lines on left and right of cylinder head.

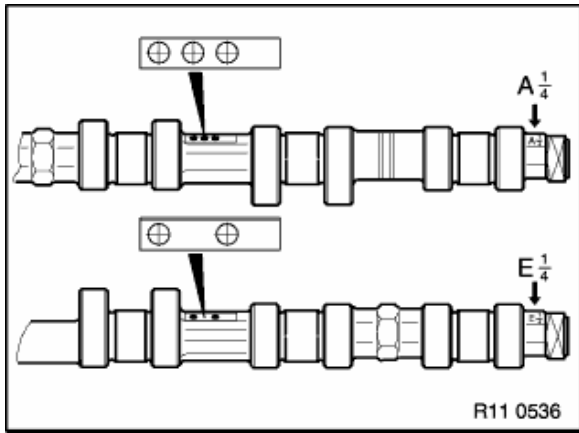


Remove vibration damper,
refer to 11 23 010.

Release central bolt of hub for vibration damper,
refer to 11 23 031.

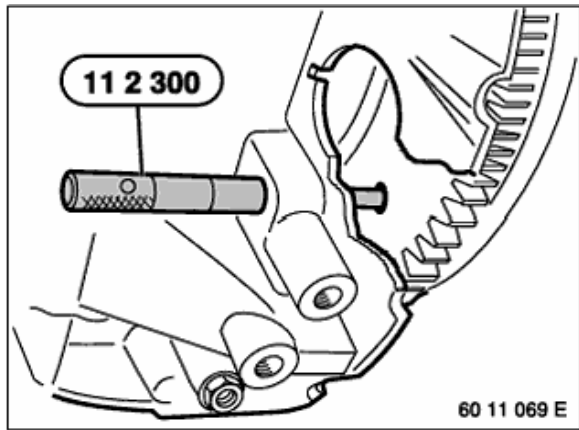


Rotate engine at slackened central bolt in direction of rotation until the first cylinder is in TDC firing position.

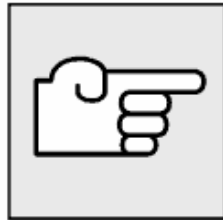


Note:

In TDC position of first cylinder, marker bores of camshafts point upwards.



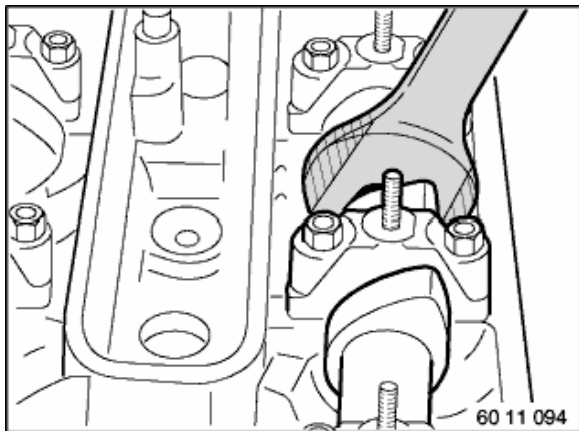
Secure crankshaft in TDC position with special tool 11 2 300.



Remove piston for chain tensioner, refer to 11 31 090.

Remove timing case cover, top left, refer to 11 14 085.

Remove timing case cover, top right, refer to 11 14 080.



Note:

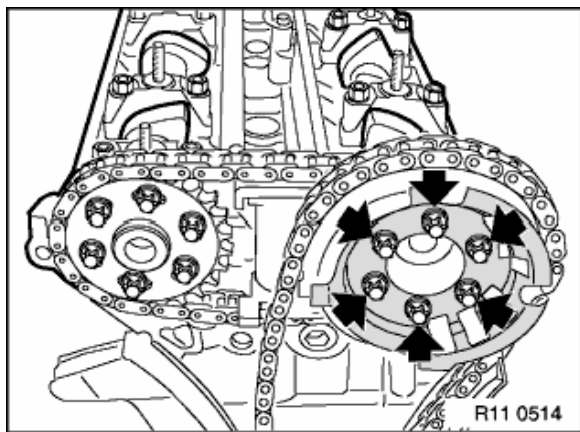
When unfastening screw connection on camshaft, brace camshaft on hex head.

Caution!

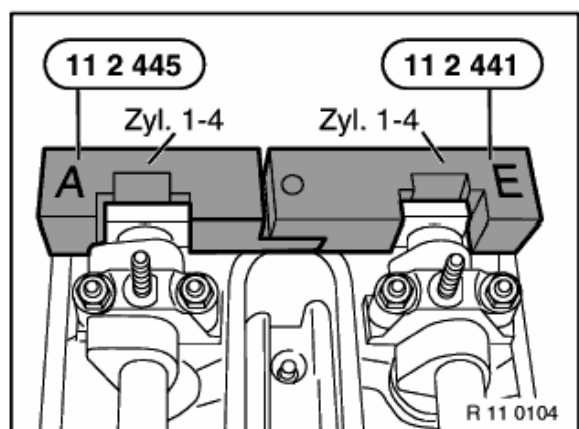
Do not damage the cylinder head.

If necessary, machine open-end wrench accordingly.

Release sprocket on right inlet camshaft (cylinder bank 1 to 4).



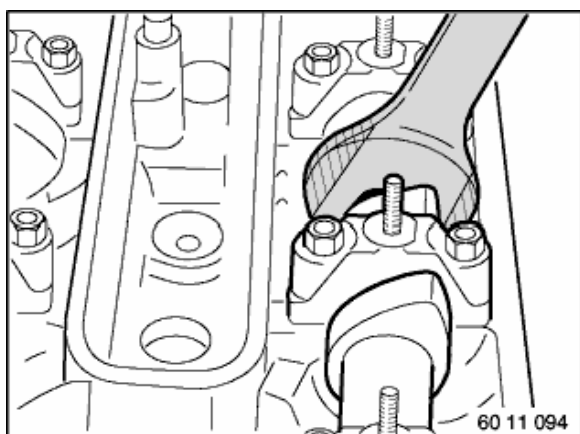
Fit special tool 11 2 445 / 441 to camshafts on cylinder bank 1 to 4.



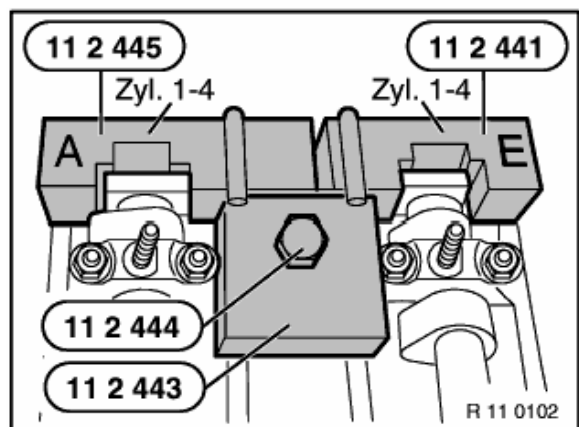
Align camshaft with open-end wrench in such a way that special tool 11 2 441 / 445 locates flush against the cylinder head.

Caution!

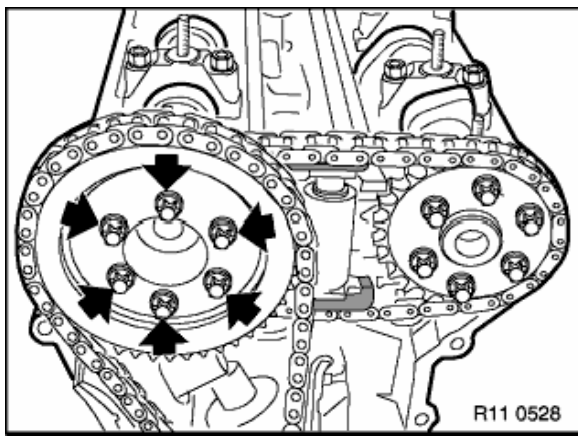
Do not damage the cylinder head.



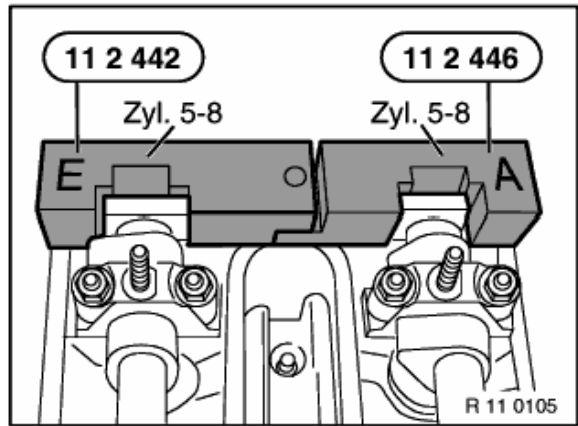
Fit special tool 11 2 443 to special tool 11 2 445 / 441 and secure with special tool 11 2 444 using the spark plug thread.



Release sprocket on left inlet camshaft (cylinder bank 5 to 8).



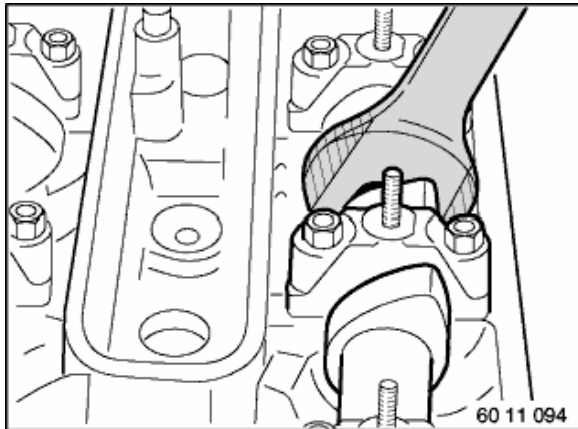
Fit special tool 11 2 446 / 442 to camshafts on cylinder bank 5 to 8.



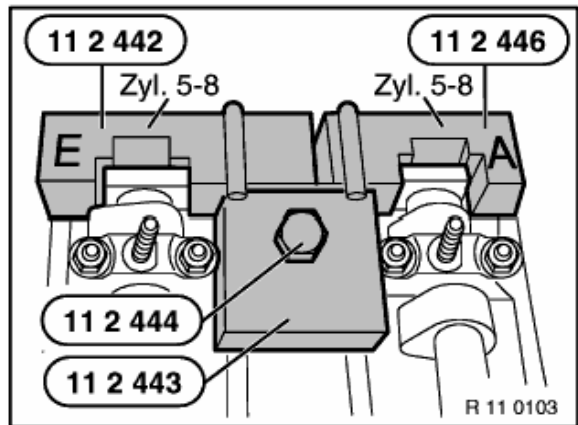
Align camshaft with open-end wrench in such a way that special tool 11 2 442 / 446 locates flush against the cylinder head.

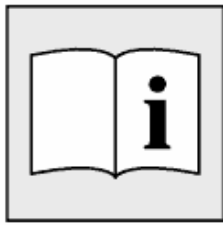
Caution!

Do not damage the cylinder head.

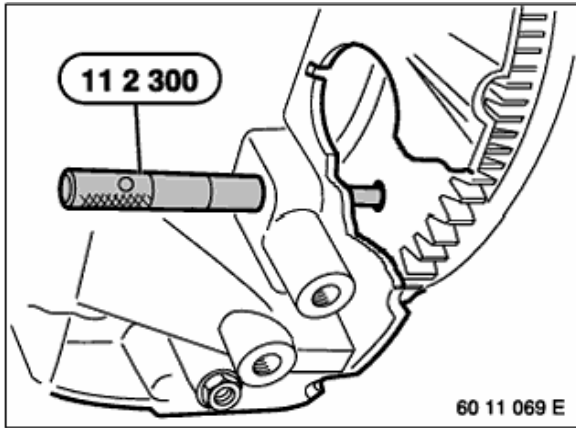


Fit special tool 11 2 443 to special tool 11 2 446 / 442 and secure with special tool 11 2 444 using the spark plug thread.





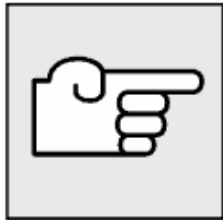
Remove loosened central screw and lift out hub for vibration damper,



Caution!

Do not turn engine any more.

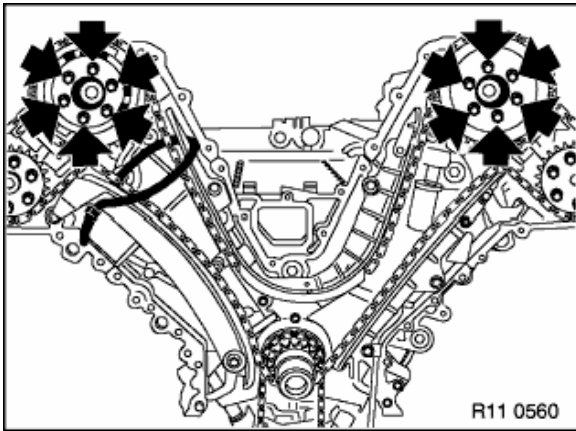
Remove special tool 11 2 300.



Remove upper oil sump section,
refer to 11 13 010.

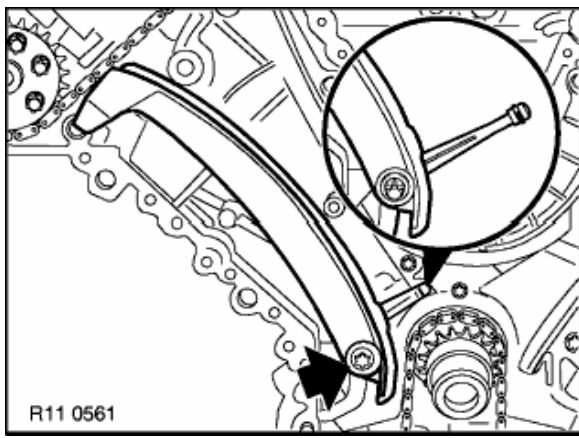
Remove water pump with thermostat housing,
refer to 11 51 000.

Remove timing case cover, bottom,
refer to 11 14 110.



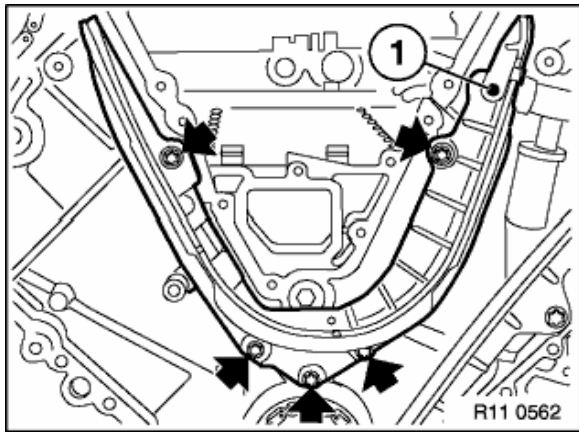
Remove sprockets from intake camshaft.

Remove timing chain.



If necessary, remove tensioning rail.

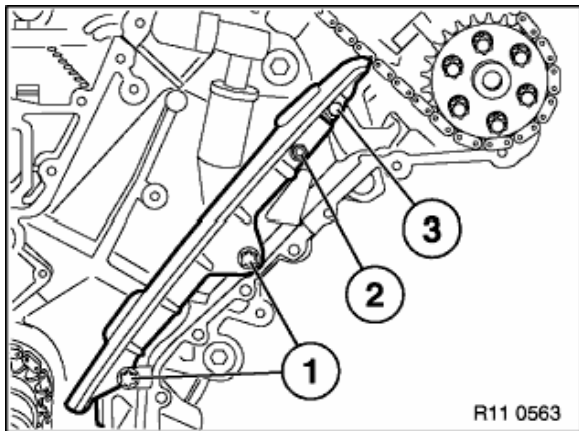
Release securing screw on tensioning rail, remove tensioning rail with oil guide.



If necessary, remove reversing rail.

Unfasten grub screw (1).

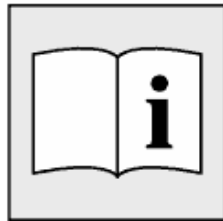
Release securing screw on reversing rail and remove reversing rail.



If necessary, remove guide rail.

First loosen screw (2) for oil separator.

Release screws (1 and 3), remove guide rail.

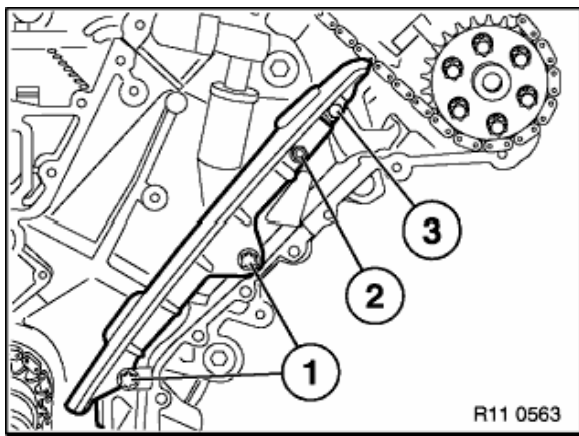


Installation

Installation of timing chain is described separately from removal. Assembly sequence for removal and installation is different.

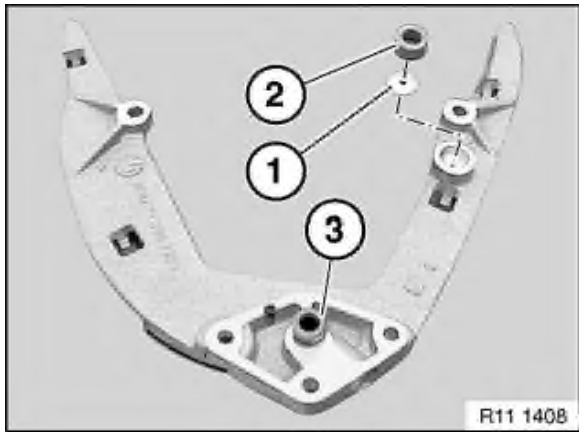
Check guide, reversing and tensioning rails, replace if necessary.

Check sprockets and replace if necessary.



Install guide rail.

- Install all screws
- Tighten screws (1)
- Tighten screw (3)
- Tighten down screw (2) for oil separator

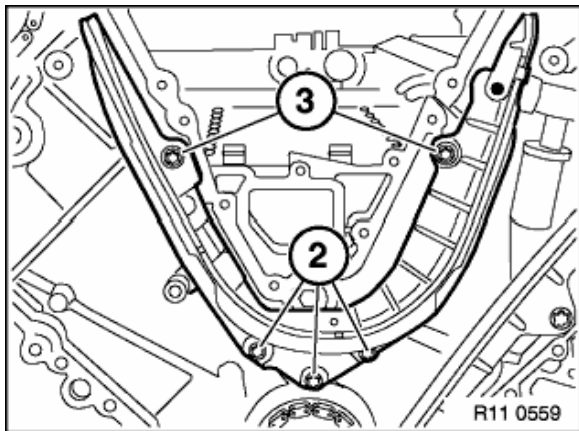


Note:

There is a small bore in the throttle ring (1).
Check throttle ring (1), replace if necessary.

1. Insert throttle ring (1) in reversing rail
2. Replace O-ring (2) and insert in reversing rail
3. Replace O-ring (3)

Coat O-ring (3) with oil as lubricant.



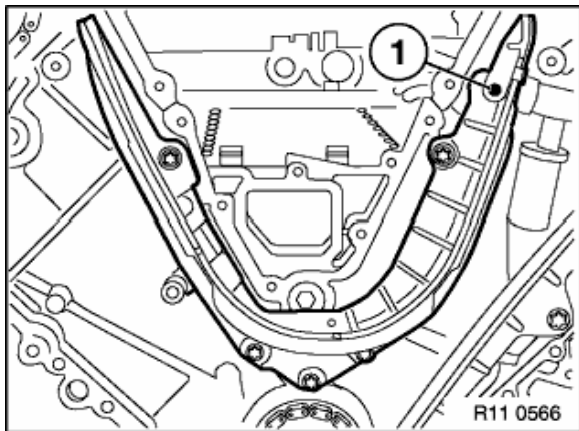
Install reversing rail and insert screws (2 and 3).

Note:

Screws (2) with M6 thread.

Screws (3) with M7 thread.

Tightening Torque for screws (2 and 3),
refer to Technical Data 11 31 10AZ.

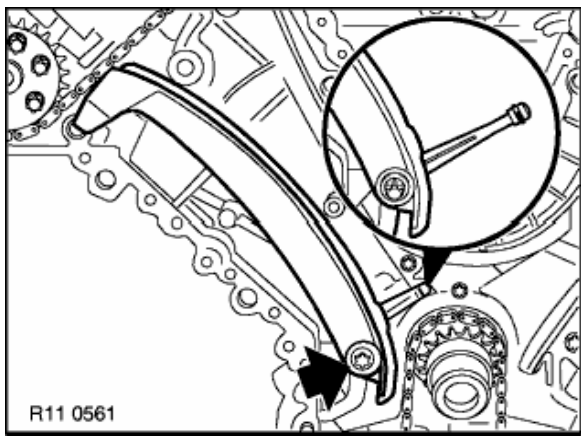


Replace grub screw (1).

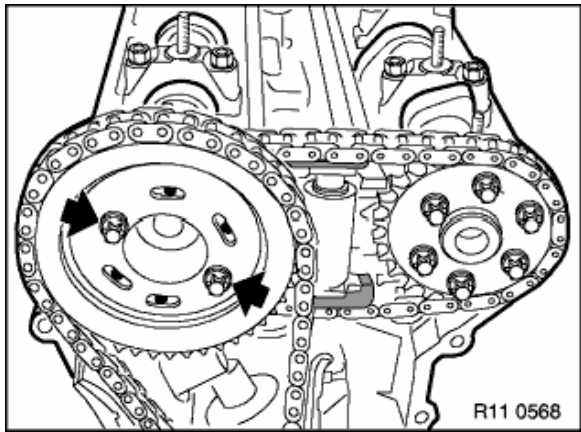
Insert grub screw only until it makes contact with angle section (1)
without play, do not tighten down.

Note:

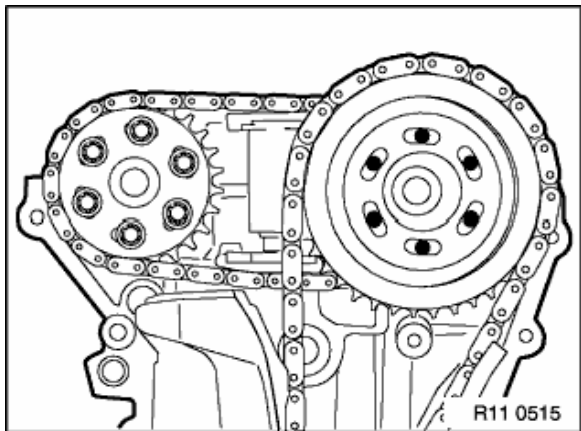
The grub screw (1) secures the angle bracket in the cylinder
head.



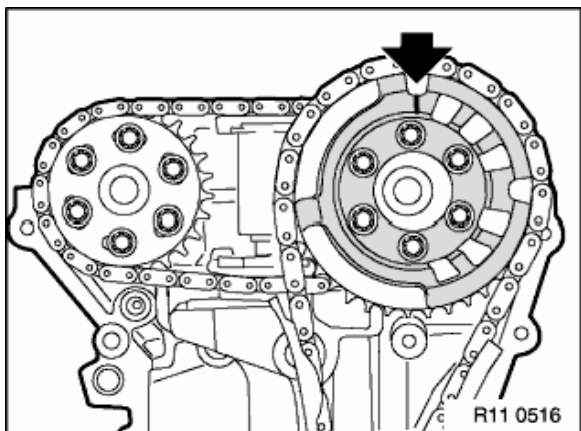
Replace O-ring.
 Install oil guide for bow cover in the pivot rail.
 Tighten down bow cover.



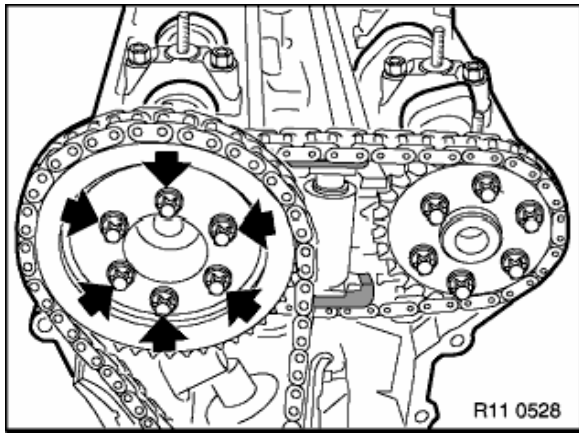
Install new timing chain.
 Fit sprocket with chain to inlet camshaft on cylinder bank 5 to 8 with long bores aligned centrally.
 Install two screws and fit flush.



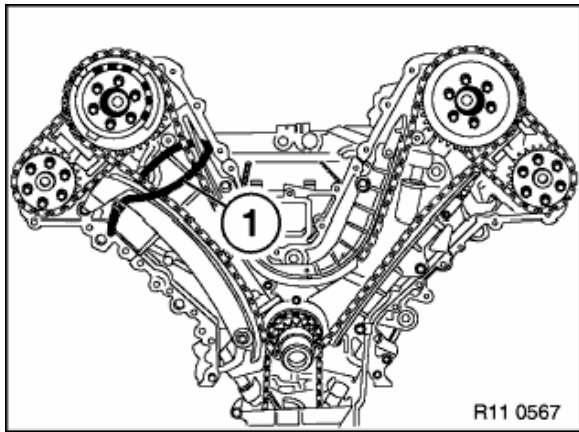
Fit sprocket with chain to inlet camshaft on cylinder bank 1 to 4 with long bores aligned centrally.
 Brace sprocket, press bow cover against the timing chain and check position of long bores on both cylinder banks.
 If necessary, remove sprockets once again and align long bores centrally.



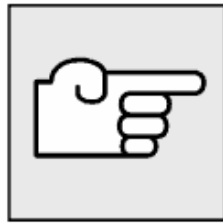
Fit sensor gear in such a way that mark on sensor gear points upward in cylinder shaft.
 Insert screws and fit flush.



Insert remaining three screws on inlet camshaft on cylinder bank 5 to 8 without play.

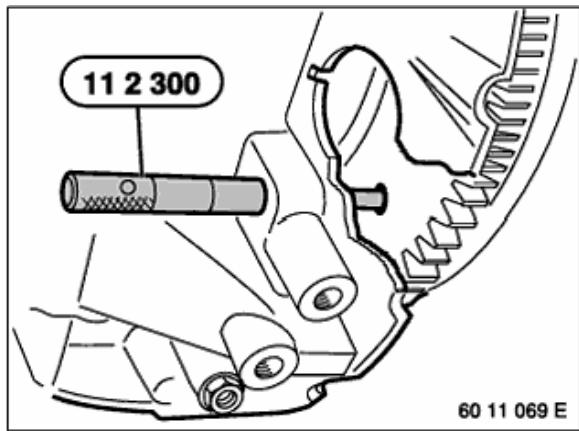


Press bow cover against the timing chain. Secure bow cover with a plastic strap (1).

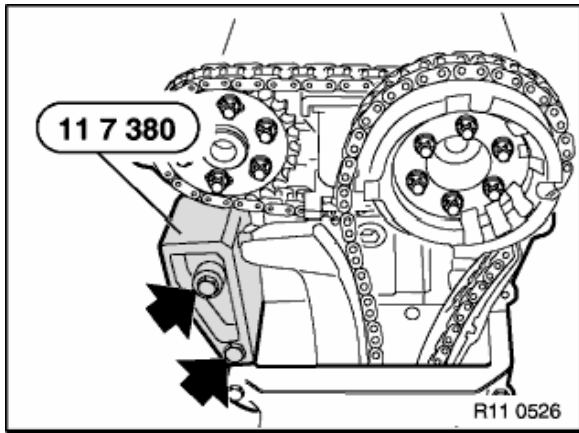


Remove timing case cover, bottom,
refer to 11 14 110.

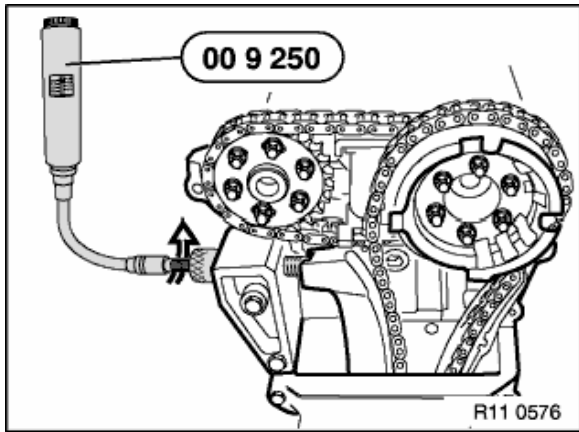
Install upper oil sump section,
refer to 11 13 010.



Secure crankshaft in TDC position with special tool 11 2 300.



Attach special tool 11 7 380 to right cylinder head (cylinder bank 1 to 4).

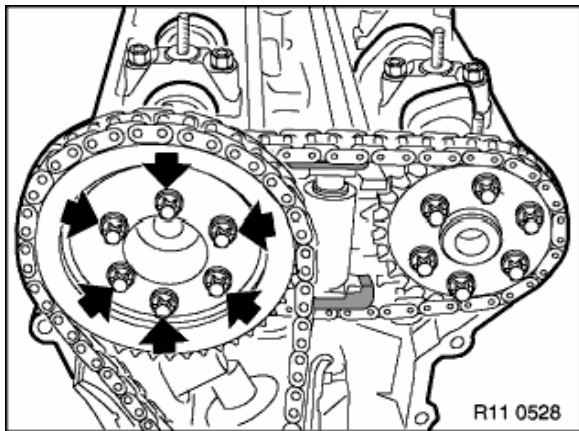


Install special tool 11 3 390 in special tool 11 7 380.

Tighten bow cover by turning the adjusting screw on the special tool 11 3 390 with special tool 00 9 250 to 0.7 Nm.

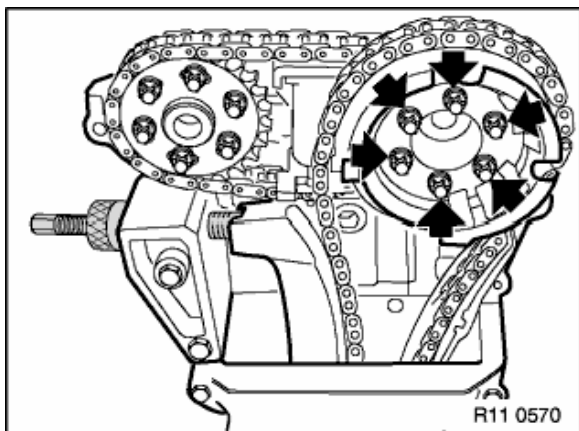
Note:

If installation tolerance is unfavorable, attach special tool 00 9 250 from underside.



Secure sprocket to inlet camshaft on cylinder bank 5 to 8.

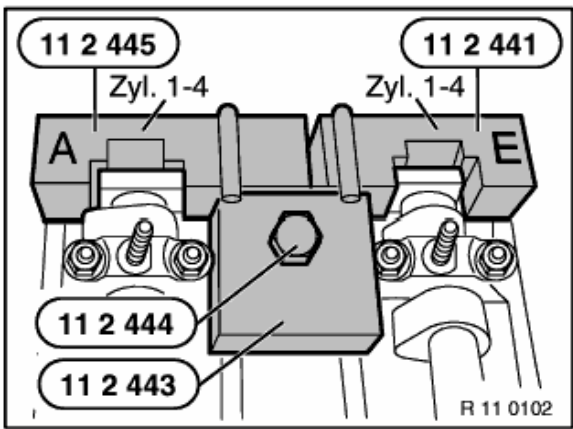
Tightening Torque,
refer to Technical Data 11 31 3AZ.



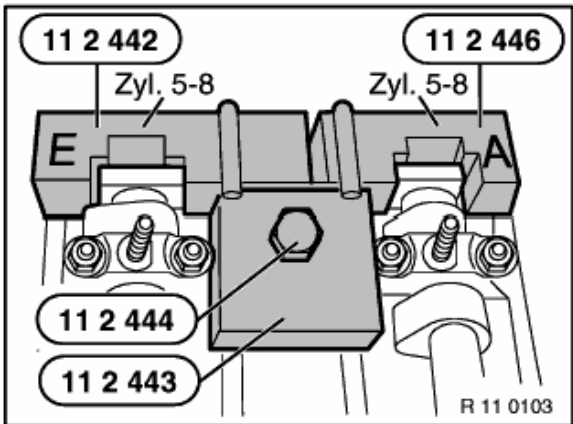
Secure sprocket to inlet camshaft on cylinder bank 1 to 4.

Tightening Torque,
refer to Technical Data 11 31 3AZ.

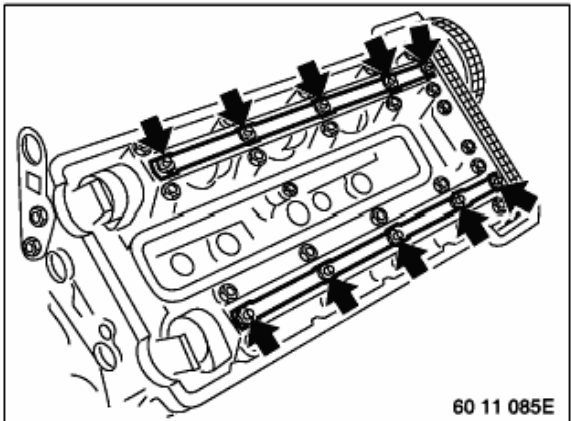
Remove special tools 11 2 444 / 443 / 441 / 445.



Remove special tools 11 2 444 / 443 / 442 / 446.



Install oil lines on left and right of cylinder head.

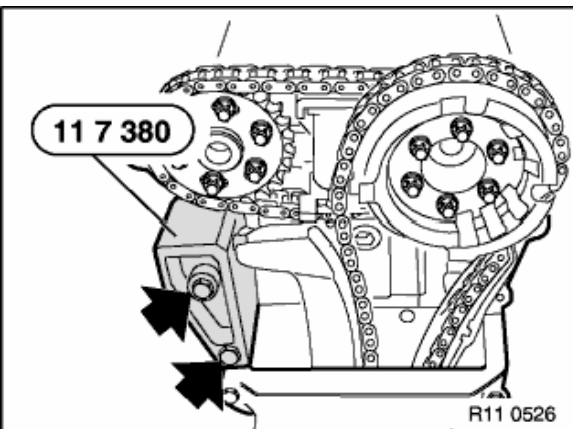


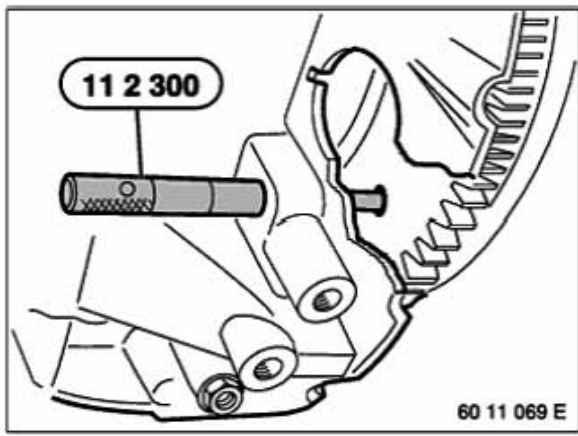
Relieve load on special tool 11 3 390 and remove with special tool 11 7 380.

Install timing case cover, top left,
refer to 11 14 085.

Install chain tensioning piston,
refer to 11 31 090.

Install timing case cover, top right,
refer to 11 14 080.





Remove special tool 11 2 300.
Assemble engine.