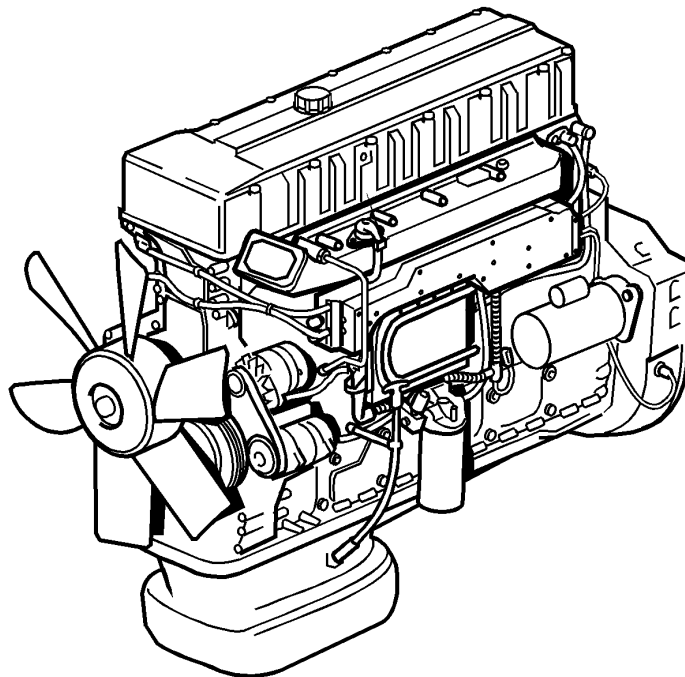


This TSI Service Bulletin and others in Groups 21 and 33 replace TSI Service Manual 210-600, "Basic Engine, D12, D12A, D12B, D12C" (8.2000), publication no. PV776-TSP142853.

Date	Group	No.	Supp.	Page
11.2001	215	004		1(11)

Timing Gears Replacement D12, D12A, D12B

Timing Gears Replacement



W2002653

Fig. 1: VOLVO D12B Engine

This information covers procedures for replacement of the timing gears on VOLVO D12, D12A, and D12B engines.

Contents

- ["Special Tools" page 2](#)
- ["Timing Gears, Replacement \(All\)" page 4](#)

Tools

Special Tools

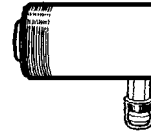
The following special tools are used to replace or repair components. The tools can be ordered from Volvo; please use the specified part number when ordering.



9992584
Hollow Drift



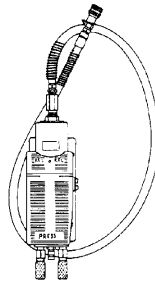
9992658
Crankshaft Drive Gear Puller



9992671
Hydraulic Cylinder, 18-ton capacity



9996160
Pins, used with Yoke 9996358



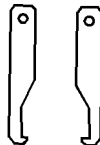
9996222
Foot Pump



9996315
Spindle



9996358
Timing Gear Yoke



9996401
Puller Arms



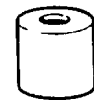
9996413
Adapter



9996600
Hydraulic Cylinder, 10-ton capacity



9996603
Adapter



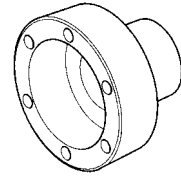
9996626
Hollow Drift



9996950
Flywheel Blocking Tool



9996956
Flywheel Turning Tool



9996958
Polygon Hub Puller



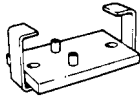
9996972
Puller



9996973
Drift



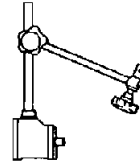
9998269
Gear Wheel Puller



9998270
Counterhold



9999683
Rocker Dial Indicator



9999696
Magnetic Stand

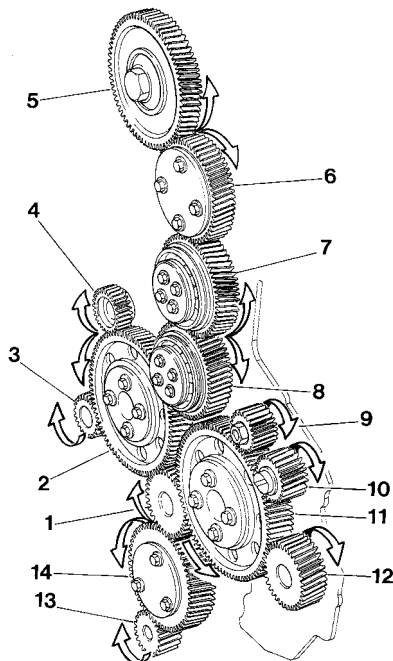
Service Procedures

2153-03-03-01 Timing Gears, Replacement (All)

(Oil pan and timing gear cover removed)

WARNING

Always wear appropriate eye protection to prevent the risk of eye injury due to contact with engine debris or fluids.



T2006852

Fig. 2: Timing gear arrangement

Description (no. of teeth):

- 1 Crankshaft Drive Gear (36)
- 2 Idler Gear, 36 mm (87)
- 3 Coolant Pump Drive Gear (24)
- 4 Air Compressor Drive Gear (27)
- 5 Camshaft (72)
- 6 Adjustable Idler Gear (58)
- 7 Upper Idler Gear (60)
- 8 Lower Idler Gear (58)
- 9 Power Steering Pump Drive Gear (22)
- 10 Drive Gear Arrangement (Accessory Drive Pulley and Fuel Feed Pump) (26)
- 11 Power Take Off (PTO) Idler Gear, 28 mm (87)
- 12 Power Take Off (PTO) Drive Gear for Hydraulic Pump (37)
- 13 Oil Pump Drive Gear (24)
- 14 Oil Pump Idler Gear (57)

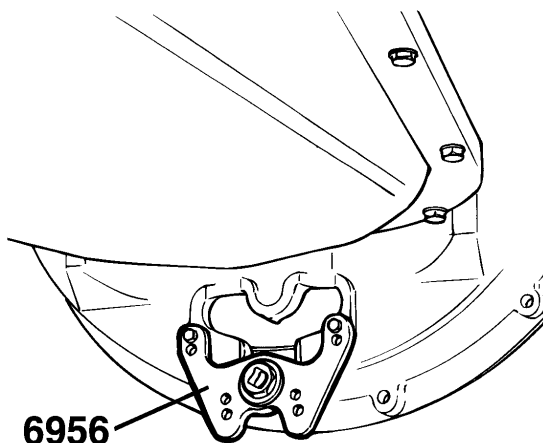
CAUTION

Never turn the crankshaft or camshaft when the timing gears have been removed. Otherwise, the pistons can come into contact with the valves resulting in damage to engine components.

Special tools: 9992584, 9992658, 9992671, 9996160, 9996222, 9996315, 9996358, 9996401, 9996413, 9996600, 9996603, 9996626, 9996900, 9996950, 9996956, 9996958, 9996965, 9996972, 9996973, 9998270, 9999683, 9999696

Removal of Drive and Idler Gears

1

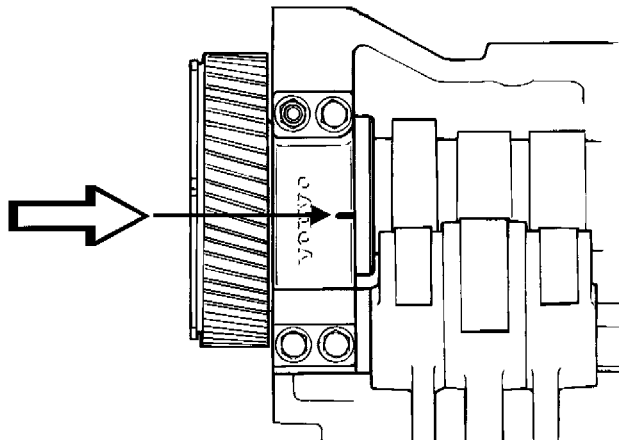


T2006672

Fig. 3: Cranking tool installed

Remove the inspection cover from beneath the flywheel housing and install cranking tool 9996956.

2

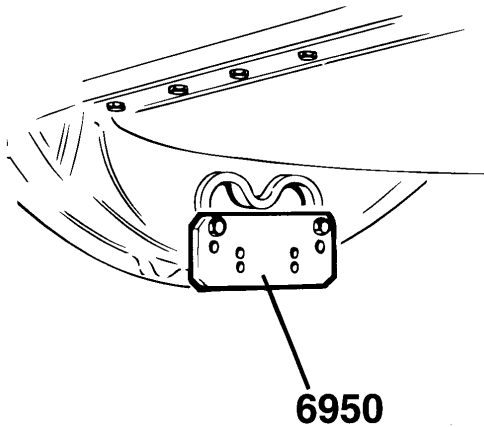


W2000936

Fig. 4: Aligning camshaft

Rotate the flywheel until number 1 piston is at TDC and the camshaft marking is opposite the marking on the cap.

3

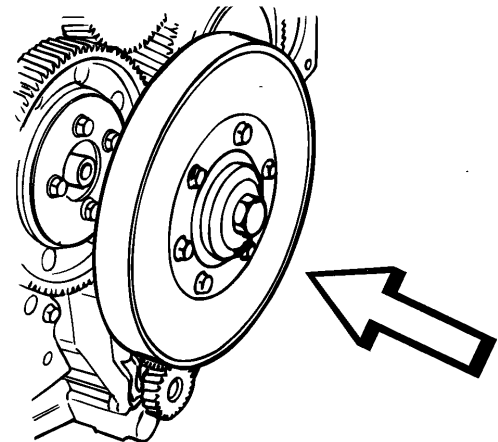


T2006666

Fig. 5: Blocking tool installed

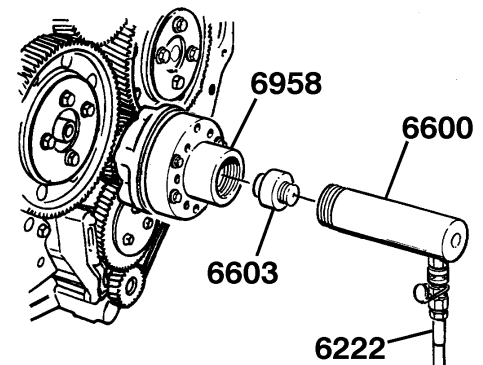
Remove cranking tool 9996956 and install blocking tool 9996950. 9996950
9996956

4



T2007076

Fig. 6: Vibration dampener



T2008984

Fig. 7: Removing polygon hub

Remove the vibration dampener. Remove the crankshaft bolt together with the washer. Secure the puller 9996958 on the polygon hub. Fit adapter 9996603 on hydraulic cylinder 9996600. Screw the hydraulic cylinder to the puller and pull off the polygon hub using foot pump 9996222.

9996958
9996413
9996600
9996603

5

Remove idler gears (see 2, 6 and 11, Fig. 2: Timing gear arrangement, page 4) from the timing gear plate.

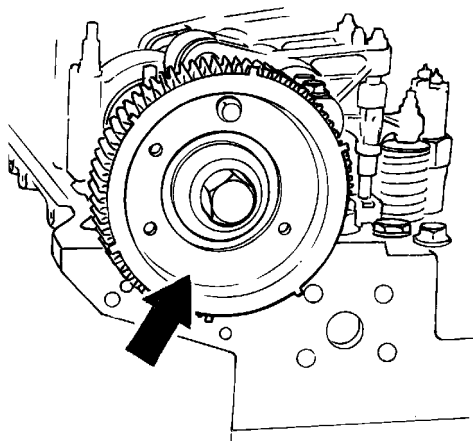
6

Remove the washers from the upper and lower idler gear (see 7 and 8, Fig. 2: Timing gear arrangement, page 4).

7

Remove the socket head bolts and remove upper and lower idler gears (see 7 and 8, Fig. 2: Timing gear arrangement, page 4). Use two screwdrivers to assist in removal.

8

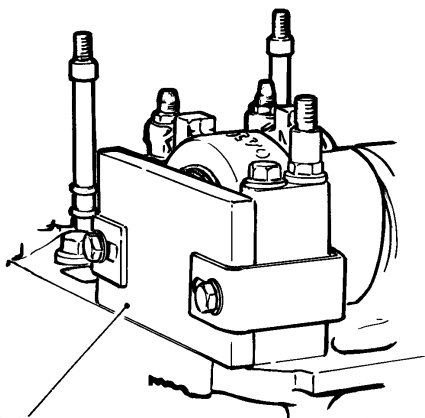


T2007096

Fig. 8: Cam sensor wheel

Remove the cam sensor wheel from the camshaft drive gear.

9

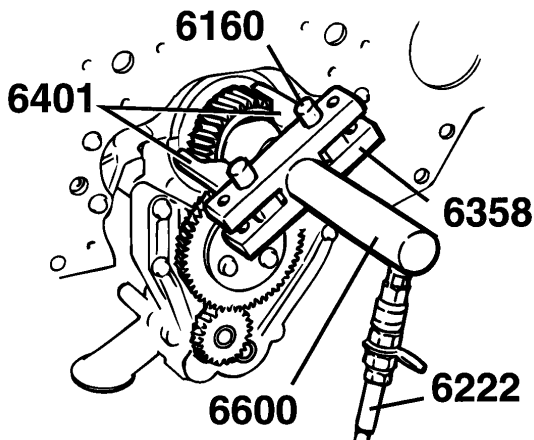


T2007148

Fig. 9: Installing counterhold tool

Attach the camshaft holding tool 9998270 to the rear camshaft support. Remove the camshaft gear retaining bolt and remove the camshaft drive gear (see 5, Fig. 2: Timing gear arrangement, page 4).

10



T2007072

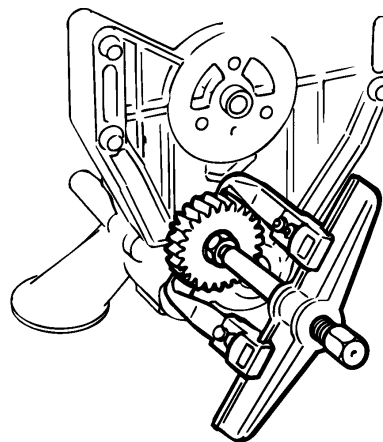
Fig. 10: Removing the crankshaft drive gear

Using cylinder 9996600, pins 9996160, puller arms 9996401, and yoke 9996358 connected to pump 9996222, remove the crankshaft drive gear (see 1, Fig. 2: Timing gear arrangement, page 4).

11

Remove the retaining bolts in the oil pump idler gear and remove the idler gear from the oil pump (see 14, Fig. 2: Timing gear arrangement, page 4).

12



T2007074

Fig. 11: Removing the oil pump drive gear

Install an M12x20 bolt in the shaft for the oil pump drive gear (see 13, Fig. 2: Timing gear arrangement, page 4). Remove the gear, using tool 9996972 and drift 9996973.

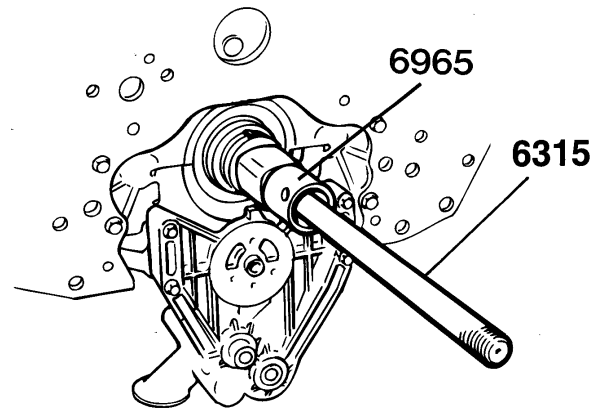
13
Remove the air compressor drive gear (see 4, Fig. 2: Timing gear arrangement, page 4).

14
Remove the power steering pump drive gear (see 9, Fig. 2: Timing gear arrangement, page 4).

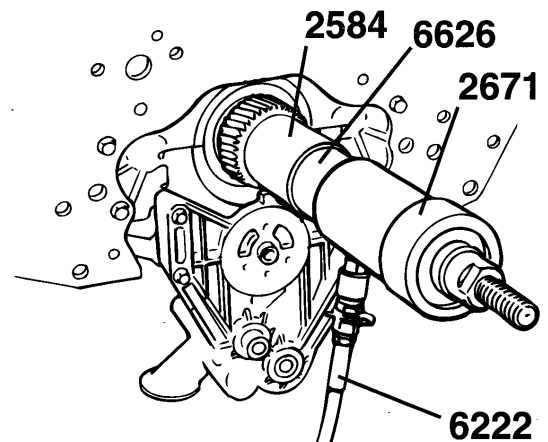
15
Install puller 9998269 onto the coolant pump drive gear (see 3, Fig. 2: Timing gear arrangement, page 4). Place a plug on the shaft as a support and pull off the gear.

Installation of Drive and Idler Gears

16



T2007151



6222

T2007080

Fig. 12: Installation of crankshaft drive gear

Install adapter and spindle on the crankshaft. Install the new crankshaft drive gear (see 1, Fig. 2: Timing gear arrangement, page 4) on the spindle 9996315. Install drifts 9992584 and 9996626 and hydraulic cylinder 9992671. Install the nut and carefully press on the drive gear, using pump 9996222.

Note: Make sure that the key remains in position in the keyway. Remove the tools.

17

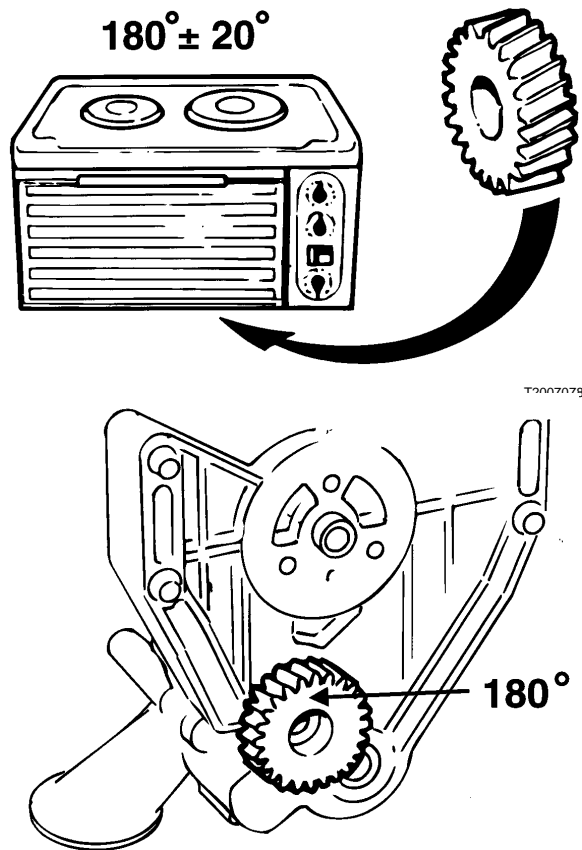


Fig. 13: Installation of the oil pump drive gear

Heat the oil pump drive gear (see 13, Fig. 2: Timing gear arrangement, page 4) to approximately 180°C (360°F) and tap it onto the lube oil pump.

18

Install the air compressor drive gear (see 4, Fig. 2: Timing gear arrangement, page 4).

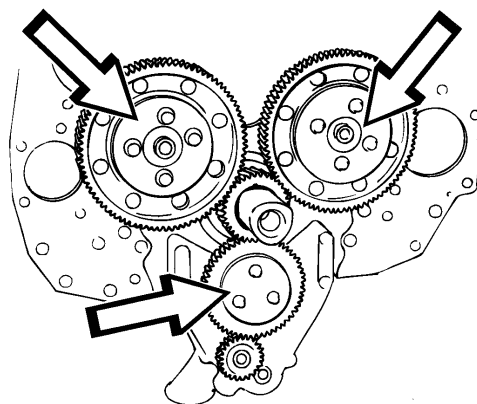
19

Install the power steering pump drive gear (see 9, Fig. 2: Timing gear arrangement, page 4).

20

Apply assembly paste to the coolant pump shaft. Install the spindle into the shaft. Place the coolant pump drive gear (see 3, Fig. 2: Timing gear arrangement, page 4) onto the spindle and press the gear on with the help of the hydraulic cylinder.

21



Idler gears

Lubricate the oil pump idler gear (see 14, Fig. 2: Timing gear arrangement, page 4) bearing and install. Torque-tighten bolts to 24 ± 4 Nm (18 ± 3 ft-lb).

24 ± 4 Nm
(18 ± 3 ft-lb)

22

Lubricate the bearings for idler gears (see 2 and 11, Fig. 2: Timing gear arrangement, page 4). Place them into position and torque-tighten bolts to 15 ± 3 Nm (11 ± 2 ft-lb). Turn an additional 120 ± 5°.

15 ± 3 Nm
(11 ± 2 ft-lb)
120 ± 5°

Note: New bolts must be used each time the idler gear is loosened or removed; these bolts are designed for single use only and cannot be torqued a second time.

23

Install upper and lower idler gears (see 7 and 8, Fig. 2: Timing gear arrangement, page 4). Torque-tighten the socket head bolts to 15 ± 3 Nm (11 ± 2 ft-lb). Turn an additional 120 ± 5°.

15 ± 3 Nm
(11 ± 2 ft-lb)
120 ± 5°

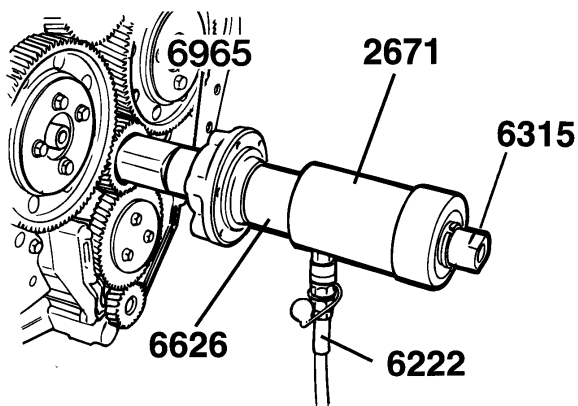
24

Install the washers for the idler gears and torque-tighten to 10 ± 2 Nm (7 ± 1 ft-lb). Turn an additional 60 ± 3°.

10 ± 2 Nm
(7 ± 1 ft-lb)
60 ± 3°

Note: New bolts must be used each time the idler gear is loosened or removed; these bolts are designed for single use only and cannot be torqued a second time.

25

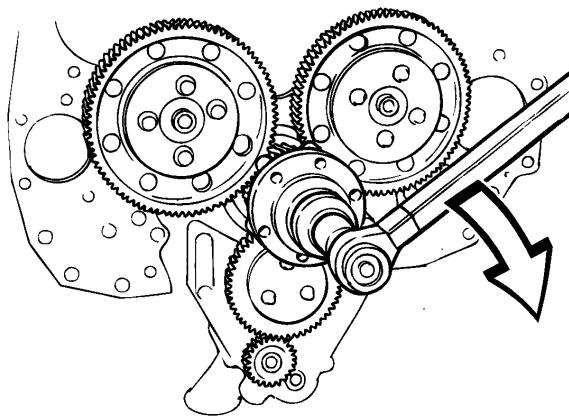


T2007155

Fig. 14: Installing polygon hub

Apply assembly paste to the crankshaft. Place the polygon hub, tool 9996626 and hydraulic cylinder 9992671 on 9996315. Install the nut 9996222 onto the spindle and use tool 9996222 to press on the polygon hub.

26



T2007125

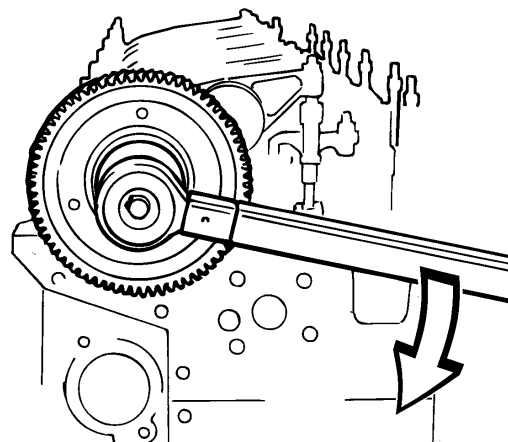
Fig. 15: Torque-tightening the crankshaft drive gear bolt

Remove the tools. Install the bolt and washer and torque-tighten to 645 ± 25 Nm (475 ± 18 ft-lb).

27

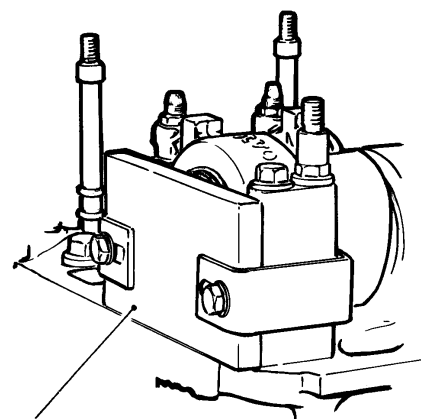
Remove blocking tool 9996950 from the flywheel housing and install flywheel turning tool 9996956.

28



T2007083

Fig. 16: Torque-tightening the camshaft drive gear bolt



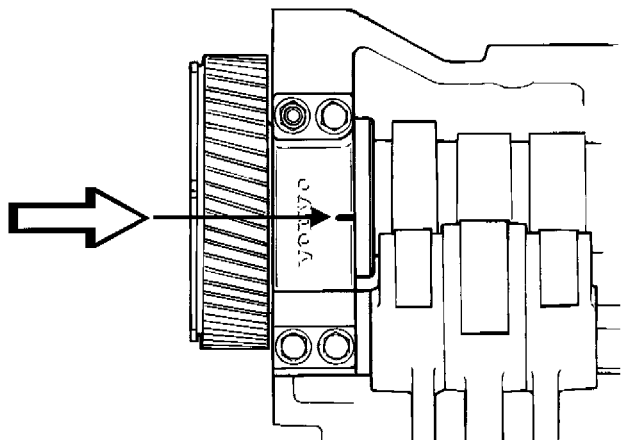
8270

T2007148

Fig. 17: Installing the camshaft drive gear

Install the camshaft drive gear. Use tool 9998270 as a support. Torque-tighten to 645 ± 25 Nm (475 ± 18 ft-lb).

29



W2000936

Fig. 18: Aligning the camshaft

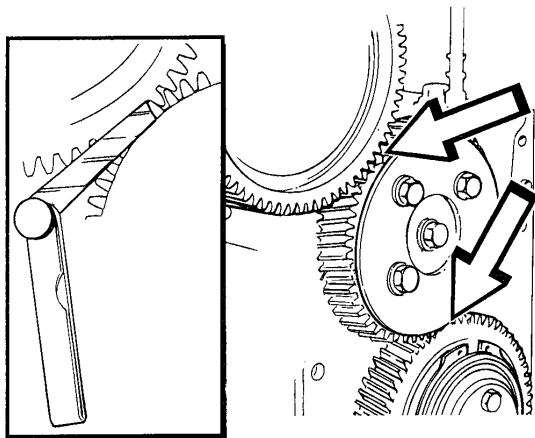
Make sure the flywheel is at 0° and that the camshaft is at TDC (see marking).

30

Install the adjustable idler gear (see 6, Fig. 2: Timing gear arrangement, page 4).

Note: Hand-tighten the bolts until they bottom against the bearing shield (these bolts will be individually replaced in a later step).

31

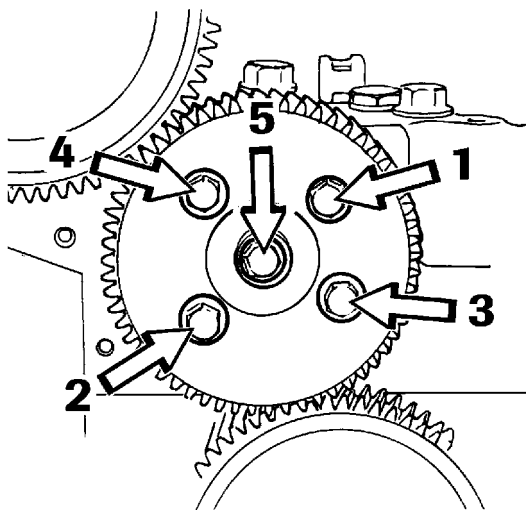


T2007158

Fig. 19: Idler gear adjustment

Adjust the idler gear using two feeler gauges. The correct backlash is 0.05 – 0.17 mm (0.002 – 0.007 in.). By using feeler gauges, an equal amount of backlash between cam gear and the nonadjustable upper idler gear can be obtained.

32



W2000723

Fig. 20: Torque-tightening sequence for adjustable idler gear

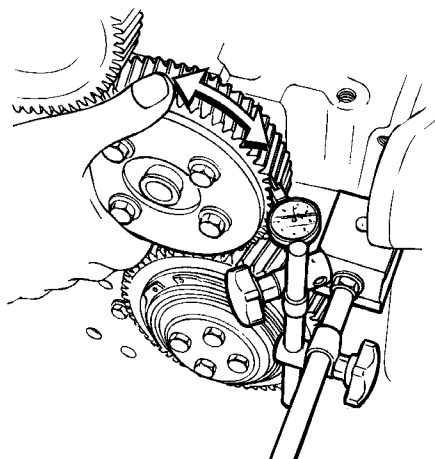
Use a two-step process to torque-tighten the idler gear bolts:

15 ± 3 Nm
(11 ± 2 ft-lb)
120 ± 5°

- Tighten to 15 ± 3 Nm (11 ± 2 ft-lb).
- Turn bolts an additional 120 ± 5°.

Note: The bolts for the adjustable idler gear are **NOT** reusable. If they are loosened or removed, they **MUST** be replaced with new bolts.

33



T2007084

Fig. 21: Checking the backlash

After adjustment, check the backlash with rocker dial indicator 9999683 mounted on magnetic base 9999696.

9999683
9999696

Note: It is important that backlash is the same for both gear wheels which mesh with the adjustable idler gear.

34

Install the cam sensor wheel on the camshaft drive gear. Install and torque-tighten the three bolts to 25 Nm (19 ft-lb).

35

Install the vibration damper and torque-tighten bolts to 50 ± 5 Nm (37 ± 4 ft-lb).

Note: New bolts should be used.