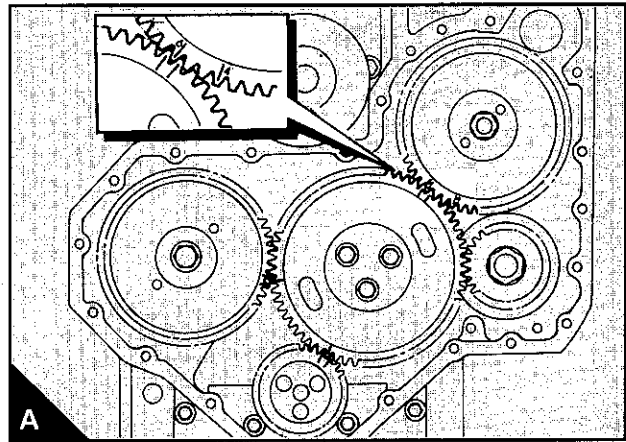


17A

General description

The timing gears are stamped with timing marks to ensure that they are assembled correctly (A). The stamped teeth of the crankshaft, the camshaft and the fuel pump gears will be in mesh with the idler gear when number 1 piston is at top dead centre (TDC) on the compression stroke. The marked teeth of the idler gear may not necessarily be in mesh, in this position, due to the different speeds at which the gears rotate.

The fuel pump gear has timing marks for four and six cylinder engines. Also the gear is stamped with the letter "B" where a Bosch fuel pump is fitted. The letter "M" is stamped on the fuel pump gear to indicate that the threads for the gear puller are metric.



To set number 1 piston to
TDC on the compression stroke

17A-01

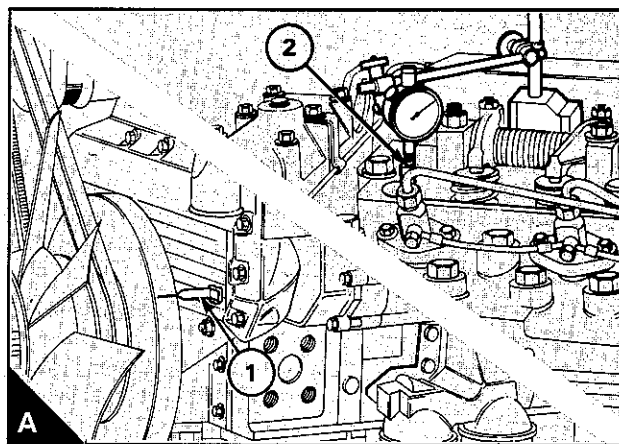
Special tools:

Valve spring compressor, PD.6118B

Stud adaptor for use with PD.6118B, PD.6118B-7

Setscrew adaptor for use with PD.6118B, PD.6118B-8

- 1 Fasten a temporary pointer to the timing case cover with its tip near to the outer edge of the crankshaft pulley or damper (A1).
- 2 Remove the rocker cover, operation 12A-01.
- 3 Turn the crankshaft, clockwise from the front, until the push rod for the inlet valve of the rear cylinder just tightens.
- 4 Remove the spring clip and the spacer from the front of the rocker shaft. Release the fasteners of the front two pedestals of the rocker shaft and remove the front rocker lever; tighten the fasteners of the rocker shaft pedestals.
- 5 Remove the valve springs from the front valve with the valve spring compressor 6118B and the adaptor PD6118-7, for pedestal studs, or the adaptor PD.6118-8, for pedestal setscrews.
- 6 Allow the valve to be held by the top of the piston. Fit a suitable collar near the top of the valve to hold the valve if the crankshaft is turned too far.
- 7 Fasten a dial test indicator with its plunger in contact with the top of the valve stem (A2) and with a reading shown on the gauge. Turn slowly the crankshaft, clockwise from the front, until the clockwise movement of the dial gauge pointer just stops. Make a suitable mark on the crankshaft pulley or damper to align with the temporary pointer. Continue to turn the crankshaft, in the same direction, until the gauge pointer just begins to move in a counter-clockwise direction. Make another mark on the pulley or damper to align with the pointer. Mark the centre point between the two marks on the pulley or damper and remove the other two marks.
- 8 Turn the crankshaft approximately 45° counter-clockwise from the front and then clockwise until the mark on the pulley or damper is aligned with the pointer. Number 1 piston is now at TDC on the compression stroke.



To check the valve timing

17A-02

1 Set the piston of number 1 cylinder to TDC on the compression stroke, operation 17A-01.

2 Remove the dial test indicator from number 1 inlet valve and fit the valve springs and the rocker lever. Ensure that the fasteners for the rocker shaft pedestals are to the correct torque.

3 Turn the crankshaft, clockwise from the front, until the inlet valve of the rear cylinder is fully open.

4 Set the valve tip clearance of number 1 cylinder inlet valve to 1,5 mm (0.059 in).

5 Turn the crankshaft, clockwise from the front, until the push rod of number 1 cylinder inlet valve just tightens. In this position, check if the mark on the crankshaft pulley or damper is within 2 1/2° of the pointer.

2 1/2° is 4,5 mm (0.18 in) at the circumference of the standard pulley, which has a diameter of 203 mm (8 in), or 7,0 mm (0.28 in) at the circumference of the large damper, which has a diameter of 310,0 mm (12.0 in).

6 If the timing is more than 2 1/2° out of position, the timing gears are probably not in correct mesh.

Attention: One tooth on the camshaft gear is equivalent to 23,0 mm (0.90 in) of pulley circumference or 35,0 mm (1.40 in) of damper circumference.

7 Turn the crankshaft, clockwise from the front, until the inlet valve of the rear cylinder is fully open. Set the valve tip clearance of the inlet valve of number 1 cylinder to 0,20 mm (0.008 in).

8 Fit the rocker cover, operation 12A-01.

9 Remove the temporary pointer from the timing case and the timing mark from the pulley or damper.

To check the timing of the fuel injection pump

17A-03

Special tools:

Timing gauge adaptor, MS.107

Spanner for flange nuts of fuel injection pump, PD.199

1 Set the piston of number 1 cylinder to TDC on the compression stroke, operation 17A-01. It is not necessary to fit a temporary pointer (17A-01/paragraph 1). Instead, the dial of the dial test indicator (A1) should be set at zero when the clockwise movement of the pointer stops (17A-01/paragraph 7).

2 Remove the high pressure pipes from the fuel injection pump. Ensure that a spanner is used to prevent movement of the pump outlets when the high pressure pipes are removed or fitted.

3 Remove the plug and washer from the rear of the fuel pump and fit the adaptor, number MS107, and a suitable dial gauge (A2). Set the dial gauge to indicate approximately 3,0 mm.

4 Slowly turn the crankshaft, counter-clockwise from the front of the engine, until the dial gauge indicates that the plunger of the fuel injection pump is at the bottom of its stroke. Set the dial to zero.

5 Slowly turn the crankshaft clockwise until the dial gauge on the valve stem indicates the correct position of the piston before TDC, see section 11C. The timing of the fuel injection pump is correct if the dial gauge on the pump plunger indicates 1,0 mm (0.039 in).

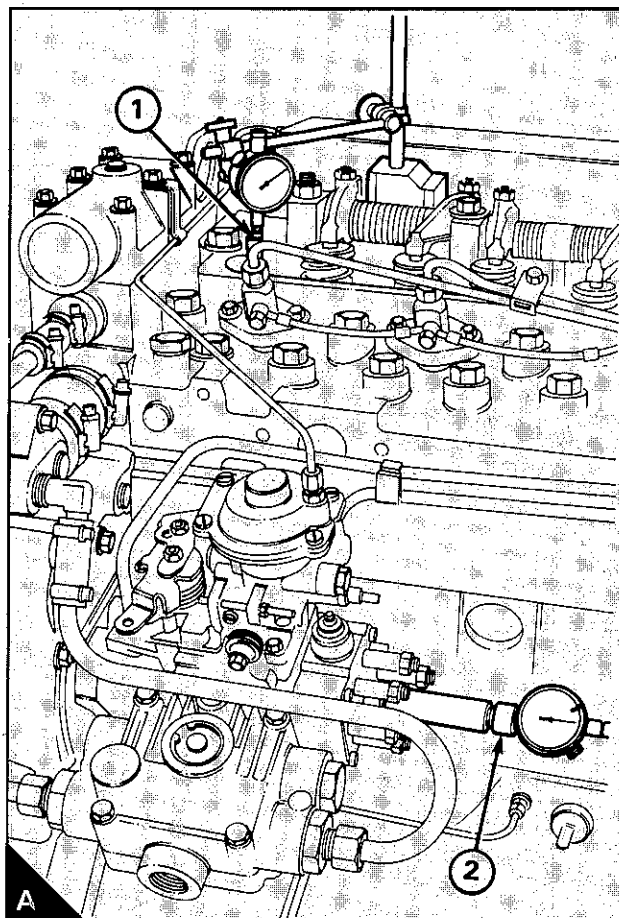
6 If the timing is not correct, disconnect the remainder of the pipes of the fuel injection pump and loosen the setscrew of support bracket for the pump.

7 To correct the timing, hold the fuel injection pump and release the flange nuts; if a compressor is fitted, it will be necessary to use tool number PD199 to release the flange nuts. If the gauge on the pump plunger indicates more than 1,0 mm (0.039 in), turn the fuel pump counter-clockwise, from the rear of the fuel pump, until the gauge indication is 1,0 mm (0.039 in). If the gauge indication is less than 1,0 mm (0.039 in), turn the fuel pump clockwise until the gauge indication is 1,0 mm (0.039 in). Tighten the flange nuts and the setscrew of the support bracket for the pump.

8 Turn the crankshaft counter-clockwise approximately 45°, then slowly clockwise to check the timing again. Continue to turn the crankshaft clockwise and check the TDC position. If the timing and the TDC are correct, remove the dial gauge and the adaptor from the fuel injection pump and fit the washer and the plug.

9 Fit all the pipes to the fuel injection pump. Remove the dial test indicator from the cylinder head and fit the valve springs and the rocker lever. Set the valve tip clearance to 0,20 mm (0.008 in). Fit the rocker cover, operation 12A-01.

10 Eliminate the air from the fuel system, operation 20A-08A.



17A

To check the timing mark of the fuel injection pump

17A-04

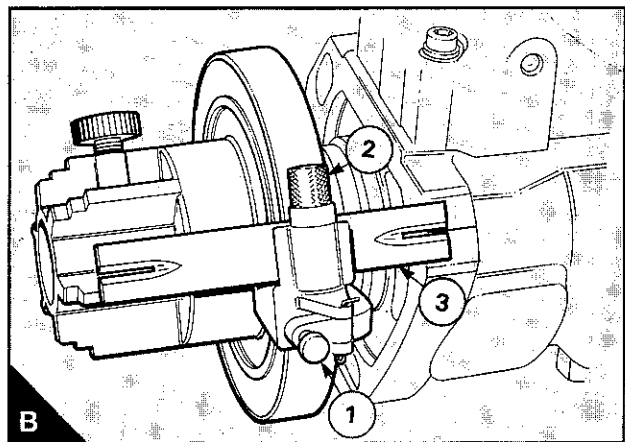
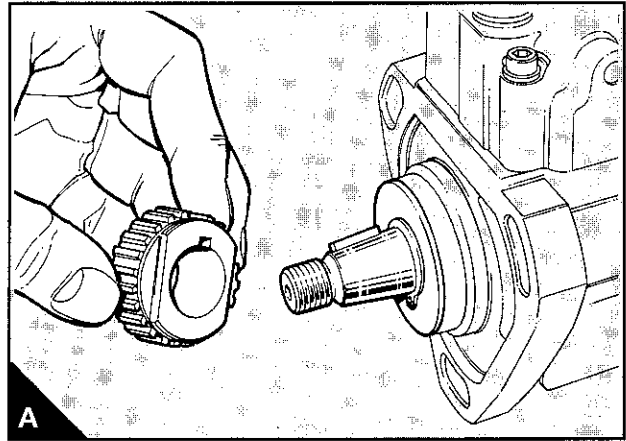
Special tools:

Pump timing gauge, MS.107

Universal timing gauge, MS.67B

Gear adaptor for use with MS.67B, PD.67-3

- 1 Remove the fuel injection pump, operation 20A-06A.
- 2 Fit the adaptor PD67-3 to the drive shaft of the fuel pump (A) and fasten it with the nut of the fuel pump gear.
- 3 Release the screw (B1), set the timing tool to the correct angle, see section 11C, and tighten the screw.
- 4 Fit the timing tool to the splined adaptor on the fuel pump drive. Release the screw (B2), slide the pointer (B3) forward until it is over the centre of the fuel pump flange and tighten the screw. Turn the timing tool and the pump shaft to align the master spline with the number 1 outlet of the pump (outlet "C").
- 5 Remove the plug and the washer from the centre of the rear of the fuel pump and fit the adaptor MS.107. Fit a dial gauge to the adaptor and set the gauge to indicate approximately 2,0 mm (0.080 in).
- 6 With the fuel injection pump held securely, turn the tool and the drive shaft counter-clockwise, from the drive end, and set the dial gauge to zero when the pump plunger is at its lowest position. Keep the fuel pump secure and turn the drive shaft clockwise until the gauge indicates 1,0 mm (0.039 in) plunger lift. At this position the slot in the pointer of the timing tool must align with the mark on the flange of the fuel pump.
- 8 If the mark is not correct, remove the timing tool and eliminate the mark on the flange. Fit the timing tool and repeat the above operation to obtain 1,0 mm (0.039 in) plunger lift. With the fuel injection pump and timing tool held securely in the correct position, make a new mark on the flange of the fuel pump, within the slot of the pointer. Release the timing tool and repeat the operation to check that the new mark is correct.
- 9 Remove the timing tool, splined adaptor and the adaptor and dial gauge. Fit the washer and plug to the rear of the fuel pump.
- 10 Fit the fuel injection pump, operation 20A-06A.
- 11 Eliminate air from the fuel system, operation 20A-08A.



To check the engine timing mark

17A-05

Special tools:

Universal timing tool, MS.67B

Drive adaptor for use with MS.67B, PD.67-2

Pointer for use with MS.67B, PD.67-4

Distance piece for use with MS.67B, PD.67-5

1 Set the piston of number 1 cylinder to TDC on the compression stroke, operation 17A-01.

2 Remove the fuel injection pump and its joint, operation 20A-06A.

3 Fit the distance piece PD67-5 (A1) to the timing tool adaptor PD67-2. Align the key in the adaptor with the keyway in the gear of the fuel pump and fit the adaptor to the gear (A). Ensure that the distance piece is against the rear face of the timing case. Secure the adaptor to the gear with the nut supplied with the adaptor.

4 Loosen the screw (B1) on the timing tool MS.67B. Set the timing tool to the correct engine check angle, see section 11C, and tighten the screw. Loosen the screw (B2) and fit the splined shaft (B5) into the timing tool (B). Loosen the screw (B4). Fit the 90° pointer PD.67-4 (B3) and tighten the screw.

5 Fit the splined shaft of the timing tool to the adaptor. Slide the timing tool along the splined shaft until it is against the adaptor and tighten the screw (B2).

6 Loosen the screw (B4). Slide the pointer forward until the flat face is against the rear face of the timing case and tighten the screw. If the mark on the timing case is correct, the mark will align with the top edge of the pointer (B3). If the mark is not correct, remove the timing tool and eliminate the mark on the timing case. Fit the timing tool. Ensure that the pointer is against the timing case and make a new mark on the timing case along the top straight edge of the pointer.

7 Remove the timing tool and the adaptor.

8 Fit the fuel pump together with a new joint, operation 20A-06A.

9 Remove the dial test indicator from the cylinder head and fit the valve springs and the rocker lever. Set the valve tip clearance of number 1 cylinder inlet valve to 0,20 mm (0.008 in). Fit the rocker cover, operation 12A-01.

10 Eliminate air from the fuel system, operation 20A-08A.

