

8

Engine timing

General description

To ensure that the 1100 Series 4 cylinder engines have an accurate system of timing, the engines are pin timed.

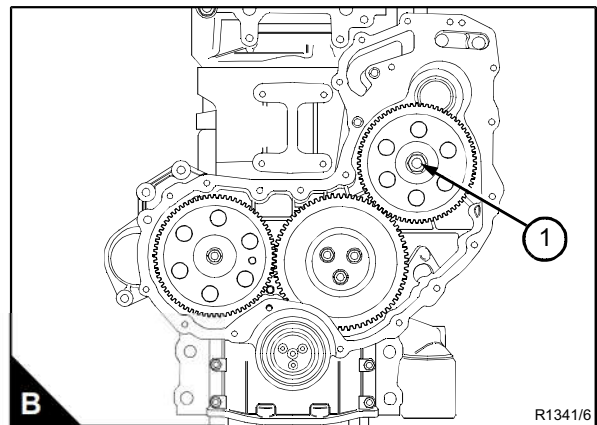
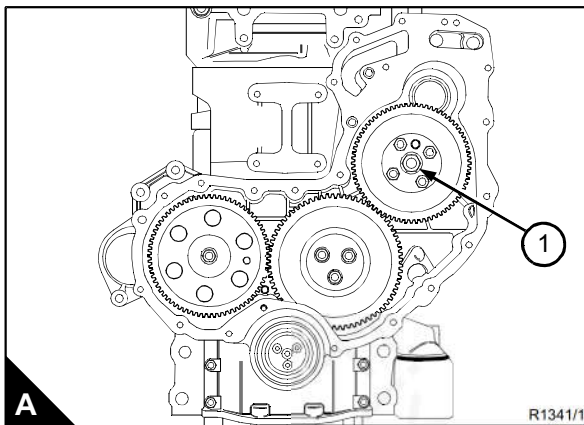
This system will set the engine so that number one piston is at top dead centre (TDC) on the compression stroke.

To reach the accurate fuel injection needed for engines to conform to emissions legislation, the latest fuel injection pumps operate at a static timing of TDC.

It is important that fuel injection timing is accurate to conform to emissions legislation. Always use Operation 8-1 to obtain TDC on the compression stroke of number one cylinder.

Cautions:

- If the hub nut (A1) is loosened the Bosch VP30 fuel injection pump timing will be lost and the fuel injection pump will have to be removed and sent to your nearest Perkins Dealer/Distributor to be reset.
- The Delphi DP210 nut (B1) must not be released until TDC on the compression stroke is set, the backlash is removed from the fuel injection pump gear and the fuel pump shaft is locked. If the nut (B1) is loosened before TDC on the compression stroke is set and the fuel pump shaft is locked the fuel pump timing will be lost. The pump will have to be removed and sent to your nearest Perkins Dealer/Distributor to be reset.
- The Bosch EPVE nut (B1) must not be released until TDC on the compression stroke is set, the backlash is removed from the fuel injection pump gear and the fuel pump shaft is locked. If the nut (B1) is loosened before TDC on the compression stroke is set and the fuel pump shaft is locked, the fuel pump timing will be lost. To adjust the fuel pump timing see, Operation 8-4.



Engine timing

To set number 1 piston to TDC on the compression stroke

Operation 8-1

Special requirements

Special tools			
Description	Part number	Description	Part number
Crankshaft timing pin	27610211	Camshaft timing pin	27610212

Cautions:

- This procedure must only be carried out by a person with the correct training.
- The timing pins are a push fit. Do not use excessive force to fit the pins.
- Do not use the pins as a locking device when repairs are carried out on the engine.
- The timing pins must be removed before the timing case cover is fitted. Failure to do so will damage the engine.
- The marks on the timing gears are not to be used as timing marks. The marks indicate the front of the gear only.

- 1 Remove the rocker cover, see Operation 3-2.
- 2 Remove the glow plugs, see Operation 14-10.
- 3 Remove the timing case cover see, Operation 6-1.

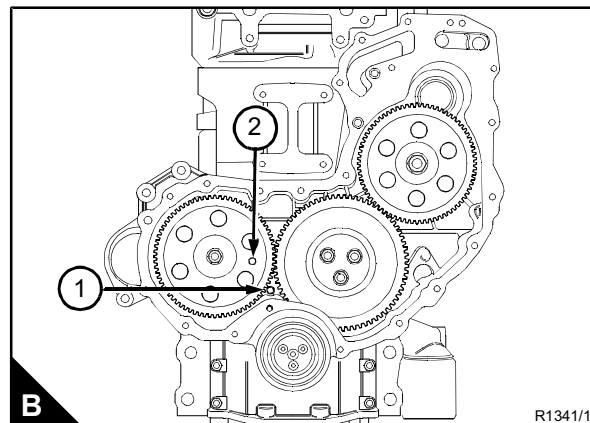
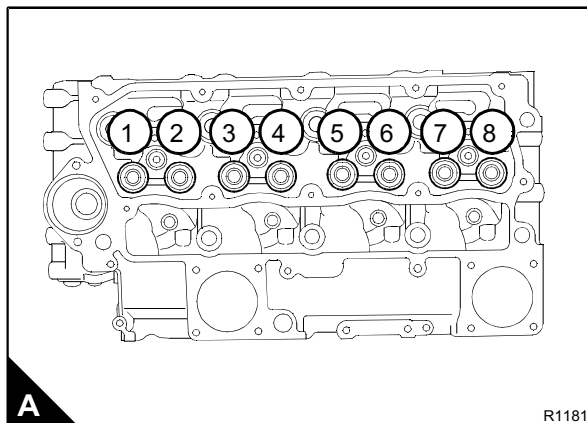
Note: The crankshaft timing pin can be inserted with the crankshaft pulley still fitted.

4 To set the No 1 piston to TDC on the correct stroke, rotate the crankshaft in the normal direction of rotation until the intake valve (A7) of number 4 cylinder has just opened and the exhaust valve (A8) of the same cylinder has not closed completely.

5 Carefully rotate the crankshaft in the normal direction of rotation. Align the hole in the crankshaft with the hole in the cylinder block and the timing case (B1). Insert the crankshaft timing pin through the timing case and the cylinder block. Push the pin fully into the hole in the crankshaft web.

6 Insert the camshaft timing pin, through the hole in the camshaft gear (B2) and into the body of the timing case. With the two timing pins fitted the engine is set at TDC number one on the compression stroke.

Note: The camshaft timing pin is a push fit into the timing case. The camshaft gear can rotate a small amount when the pin is fitted. This is to allow the assembly of the gears and removal of the backlash from the gears, with the timing pins fitted.



- 7 Remove the timing pin from each gear.
- 8 Fit the timing case cover, see Operation 6-2.
- 9 Fit the glow plugs, see Operation 14-10.
- 10 Fit the rocker cover, see Operation 3-3.

Delphi DP210 fuel injection pump

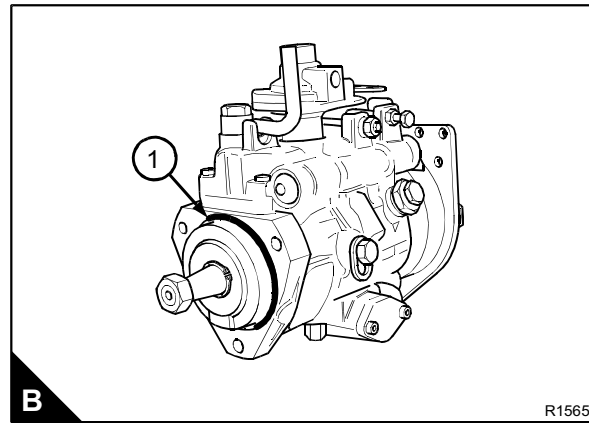
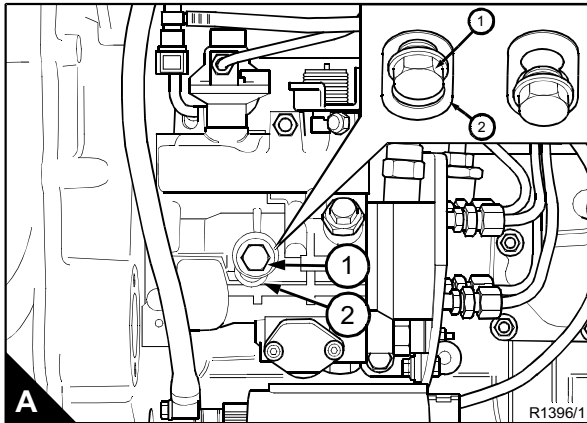
General description

Cautions:

- If the fuel injection pump is removed from the engine it will need to be returned to your nearest Perkins Dealer/Distributor for the pump timing to be checked or reset.
- Do not unlock the shaft of the fuel injection pump until the fuel pump gear is fitted.
- A new fuel injection pump will be supplied with the pump shaft in the locked position. The drive shaft of the pump must not be turned without the spacer (A2) in position under the locking screw (A1).

Delphi DP210 fuel injection pumps have a drive gear fastened to the shaft of the pump.

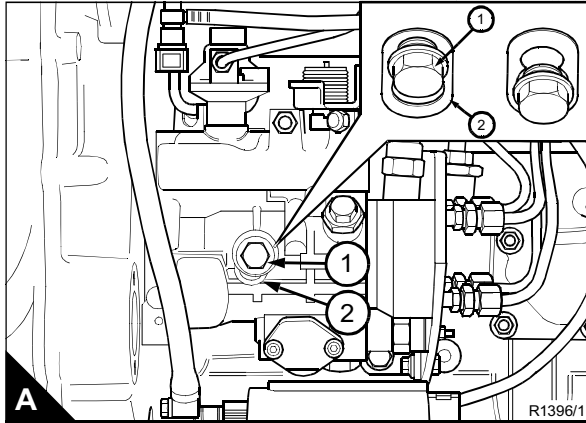
An 'O' ring (B1) is fitted into a groove in the pump flange. This 'O' ring is fitted instead of a joint between the pump flange and the timing case.



To remove

Operation 11-13

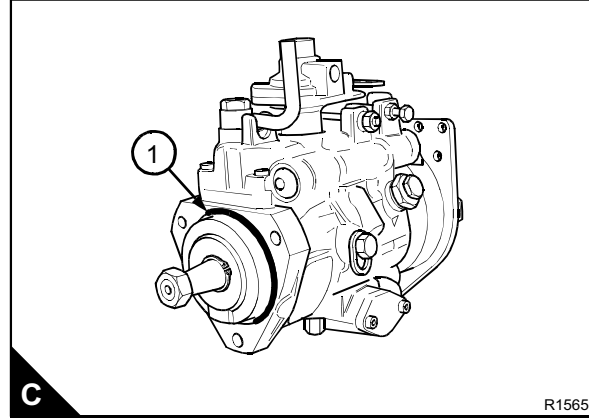
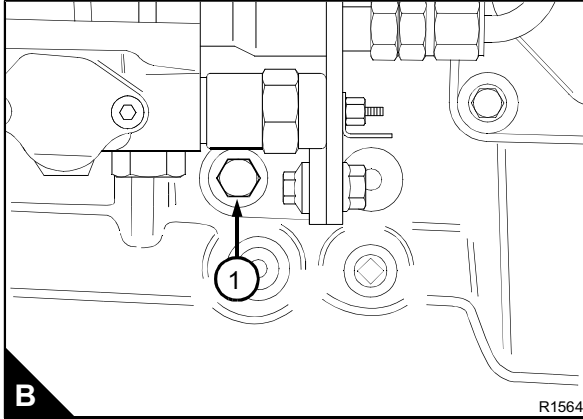
- 1 Disconnect the battery.
- 2 Set the engine to TDC number 1 cylinder compression stroke, see Operation 8-1.
- 3 Lock the pump shaft; To lock the fuel injection pump shaft loosen the locking screw (A2) and rotate the washer (A1). Tighten the locking screw (A2) to 17 Nm (12 lbf ft) 1,7 kgf m.
Caution: Use a second spanner to prevent movement of the high pressure outlet on the pump when the union nut for each high pressure pipe is released.
- 4 Remove the low pressure and the high pressure fuel pipes from the pump.



Continued

Caution: Do not rotate the crankshaft when the pump is not on the engine.

- 5 Remove the fuel pump gear, see Operation 6-3.
- 6 Remove the setscrew from the fuel pump support bracket (B1).
- 7 Remove the setscrews and washers that secure the fuel pump and remove the pump.
- 8 Discard the fuel pump 'O' ring (C1).



To fit

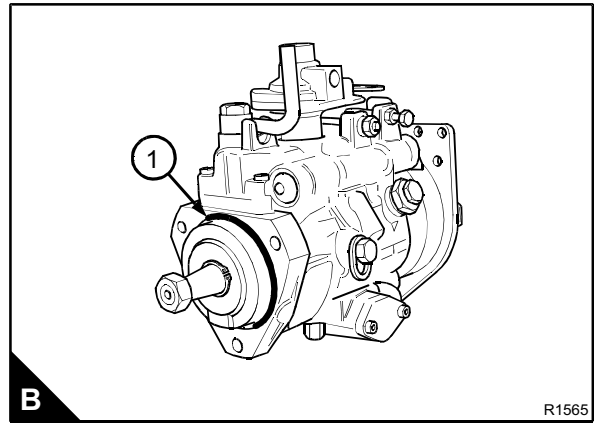
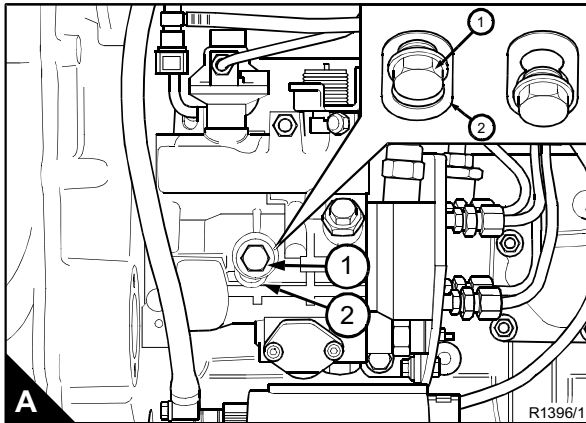
Operation 11-14

Cautions:

- The engine must be set to TDC number 1 cylinder, compression stroke before the pump is fitted, see Operation 8-1.
- Do not unlock the shaft of the fuel injection pump until the fuel pump gear is fitted.
- A new fuel injection pump will be supplied with the pump shaft in the locked position. The drive shaft of the pump must not be turned without the spacer (A2) in position under the locking screw (A1).

1 Fit a new 'O' ring (B1) to the pump flange. Lightly lubricate the 'O' ring with clean engine lubricating oil.

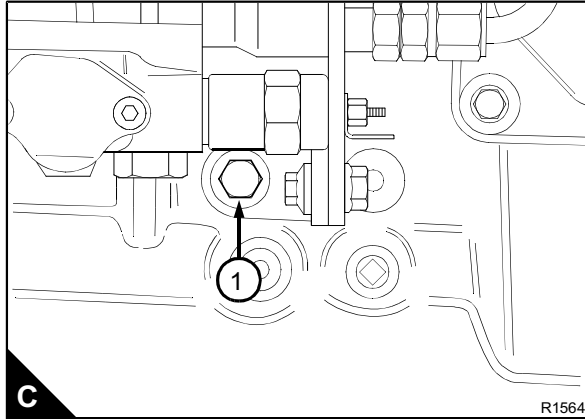
2 Fit the pump into position in the timing case, fit the three washers and setscrews, then tighten the setscrews to 25 Nm (18 lbf ft) 2,5 kgf m.

*Continued*

- 3 Loosely fit the setscrew (C1) of the support bracket. Ensure that force is not applied to the fuel pump.
- 4 Fit the fuel pump gear, see Operation 6-4.

Caution: *The fuel pump gear must be fitted to the engine before the crankshaft is rotated.*

- 5 Fit the timing case cover, see Operation 6-2.
- 6 Tighten the setscrew (C1) of the support bracket to 44 Nm (32 lbf ft) 4,4 kgf m. Ensure that force is not applied to the fuel pump.



Cautions:

- *Do not tighten the union nuts of the high-pressure pipes more than the recommended torque tension. If there is a leakage from the union nut, ensure that the pipe is correctly aligned with the pump outlet. Do not tighten the pump union nut more, as this can cause a restriction at the end of the pipe. This can affect the fuel delivery.*
 - *Use a second spanner to prevent movement of the high pressure outlet on the pump when the union nut for each high pressure pipe is tightened.*
- 7 Fit the low pressure and the high pressure fuel pipes to the pump. Tighten the high pressure pipe union nuts to 27,5 Nm (21 lbf ft) 2,8 kgf m.
 - 8 Connect the battery.
 - 9 Eliminate air from the fuel system, see Operation 11-8.
 - 10 Operate the engine and check for leakage of fuel and that there is no air in the system.